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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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The Education Bill

The Education Bill has passed its third reading in the House of Commons and hence is likely to become law without further substantial alteration. In one way it has pleased everybody, because the religious differences which have affected earlier measures have been absent. In another way it pleases nobody. It is very doubtful if it pleases the average parent, the demand for maintenance allowances having been successfully resisted for the additional year. It does not please industry, not so much because it raises the age as because industry is doubtful whether the present educational machine is competent to make the best use of the extra year. It does not please those who wanted the age raised without exemptions, and practically all those professionally interested in education fall into this class. And it is suggested that the demand for exemptions may reach 75 per cent. of those actually entitled to remain at school until 15; that the provision to be made by the Board of Education for those remaining is based, in fact, on an estimated exemption of 50 per cent. What substantial difference is made by such a measure, when boys and girls can at present stay at school after the age of 14 if they so wish? In some areas the leaving age is already 14 years 6 months. The Bill will raise it perhaps to 14 years 9 months on the average.

It will, of course, be the more enlightened parent who will keep his child at school until 15. If the fulfilment of the Hadow plan is seriously embarked upon in respect of this group of children, and if the measure be regarded as establishing the principle of a school-leaving age of 15, to be completed, in fact, at some future date, then there is little objection likely to be taken to it in industry. Many schemes of apprenticeship and employment prefer not to take boys until they are 16, and we are of the opinion that industry will get little satisfaction out of education until it takes seriously the task of saying what it wants from education and seeing that it gets it. That need not and does not involve the short view. But it might revolutionise education by insisting that primary education should be made an end in itself and not a preparation for a secondary education which will be followed by only a small proportion; just as secondary education might become complete in itself and not a preparation for that still smaller proportion intending to or fitted to enter the Universities. The uneasy marriage between industry and education through technical evening classes should be replaced by a much closer and stronger bond, if industry is to rely on a personnel of the kind it needs for the future.

Employer Prospectuses

Bearing the caption "Your Works and Ours," R. A. Lister & Company, Limited, of Dursley, Gloucestershire, have prepared a 46-page booklet for distribution to their employees, written with the object of familiarising newcomers to the firm with the salient features of the organisation. The booklet gives a short history of the firm; a "camera trip" through the plant; a list of their lines of manufacture; conditions of employment; how job cards are used; details of their milk scheme; the suggestion box; the functions of the joint board; particulars of the output efficiency bonus; the various welfare schemes available and the opportunities offered through membership of the Lister Club. This is the first booklet of its type that has ever been brought to our notice, though we well remember, in pre-war days, examining the conditions of employment issued in booklet form by one of the largest armament firms. This consisted of a few pages of "Thou shall not's" supplemented by appropriate penalties. When one buys a partnership, one is morally entitled to a full statement of the history and major activities of the business it is proposed to join, and it seems logical to us that all firms should extend a similar courtesy to those who join their ranks. The larger the firm the more necessary it becomes, because for the smallest ones the necessary information can usually be given verbally. The make-up of such booklets as the one issued by Listers must receive the most careful attention of the directorate as it is, on the one hand, a legal document, and on the other an advertisement for the firm. The former is of necessity bound to reveal the firm in its worst aspect, as protection has to be sought against the worst type of individual who may join the ranks, whilst the latter has to be prepared with the object of instilling *esprit de corps* in the personnel. On the reconciliation of these two major factors will depend the success of the appeal.

We can certainly congratulate those responsible for the excellent balance achieved by the Lister organisation. For vertical and horizontal trusts we suggest that it is the duty of each constituent company to issue its own booklet, as *esprit de corps* is easier to achieve for the smaller units, whilst obviously conditions of employment may not be unified. The provision of such booklets is worth while, but an infinite amount of care must be bestowed upon their preparation. Above all, they must be well printed and illustrated.

Students' Corner

SECOND SERIES

Cupola Practice—*(continued)*

Q. 15.—*What are the advantages and disadvantages of a receiver attached to a cupola?*

A.—The two main advantages are (1) that the depth of coke underneath the tuyeres may be very small, and the melted metal as it passes downwards on to the cupola bottom flows straight into the receiver, and (2) the receiver will hold a considerable quantity of molten metal before tapping is necessary. These advantages are offset, however, since the receiver requires almost as much preliminary preparation as the cupola itself, and with a receiver, slagging off is more difficult, as the iron is chilled by the blast, some of which passes into the receiver.

The detachable receiver is a modern invention and is for the special purpose of allowing further treatment of the metal to take place whilst in the receiver.

Q. 16.—*Are drop-bottom cupolas an improvement upon solid-bottom cupolas?*

A.—Only so far as "letting-out" is concerned, which saves much time and labour as compared with "raking out." More time and skill are required, however, when getting the drop-bottom ready for a "blow," and risk of a "run-out" on a drop-bottom cupola must also be taken into account.

Q. 17.—*Are mechanically-charged cupolas a success?*

A.—Only when the mechanical arrangements are really efficient.

Q. 18.—*Give some examples, with particulars, of cupolas actually in work.*

A.—The following will supply records of cupolas in actual operation, and should be studied separately.

(1)

Dia. of cupola at tuyeres ...	36 ins.
Metal melted per hr.	12,000 lbs.
Average area of tuyeres ...	200 ins.
Coke consumption per ton ...	200 lbs.
Weight of metal charges ...	1,000 lbs.
Blast pressure	10 ozs.
Limestone per ton of metal ...	28 lbs.
Type of blower	Fan (Sturtevant).

(2)

Dia. of cupola at tuyeres ...	48 ins.
Metal melted per hr.	16,000 lbs.
Average area of tuyeres ...	360 sq. ins.
Coke consumption per ton ...	1½ cwts.
Weight of metal charges ...	20 cwts.
Blast pressure	8 ozs.
Limestone per ton of metal ...	30 lbs.
Type of blower	Blowing engine.

Note.—The low blast pressure is due to ample tuyere area.

(3)

Dia. of cupola at tuyeres ...	60 ins.
Metal melted per hr.	24,000 lbs.
Average area of tuyeres ...	400 sq. ins.
Coke consumption per ton ...	2 cwts.
Weight of metal charges ...	3,000 lbs.
Blast pressure	12 ozs.
Limestone per ton of metal ...	76 lbs.
Type of blower	Fan.

(4)

Dia. of cupola at tuyeres ...	72 ins.
Metal melted per hr.	35,000 lbs.
Average area of tuyeres ...	486 sq. ins.
Coke consumption per ton ...	2 cwts.
Weight of metal charges ...	3,000 lbs.
Blast pressure	16 ozs.
Limestone per ton of metal ...	76 lbs.
Type of blower	Fan.

Pressure of the blast in relation to its volume from an orifice being 1 sq. in. in area with dry air escaping into the atmosphere may be seen from the following table :—

Pressure.	Volume in cub. ft. discharged per min.	Horse-power.
8 ozs.	99.9	0.218
16 ozs.	139.0	0.606

Note.—The increase of pressure by 100 per cent. results in an increase of volume by 40 per cent., and power by 178 per cent.

Q. 19.—*Is it possible to provide in a condensed, o-tabular form, the essentials of cupola practice and operation?*

A.—Only so far as the following facts may be applied, since the human factor enters largely into cupola operation.

Dia. of cupola, ins.	Blast pressure, ozs.	Weight of metal charges, cwts.	Total tuyere area, sq. ins.	Height of charging door above tuyeres.	Tons melted per hr.
24	6	6	100	6 ft.	1½
36	9	12	200	8 ft.	4½
48	11	20	300	10 ft.	8
60	13	25	400	12 ft.	14
72	14	30	500	14 ft.	18

A cupola melting 1 ton of iron per hr. requires 500 cub. ft. of air per min.

A cupola melting 2 tons of iron per hr. requires 1,000 cub. ft. of air per min.

A cupola melting 3 tons of iron per hr. requires 1,500 cub. ft. of air per min.

A cupola melting 4 tons of iron per hr. requires 2,000 cub. ft. of air per min.

A cupola melting 5 tons of iron per hr. requires 2,500 cub. ft. of air per min.

A cupola melting 6 tons of iron per hr. requires 3,000 cub. ft. of air per min.

A cupola melting 7 tons of iron per hr. requires 3,500 cub. ft. of air per min.

A cupola melting 8 tons of iron per hr. requires 4,000 cub. ft. of air per min.

A cupola melting 9 tons of iron per hr. requires 4,500 cub. ft. of air per min.

A cupola melting 10 tons of iron per hr. requires 5,000 cub. ft. of air per min.

Ten pounds of iron per lb. of coke equals 2 cwts. of coke per ton of iron melted, and requires 30,000 cub. ft. of air.

An average limestone flux required is 50 lbs. per ton of iron melted.

A cupola will melt about 10 lbs. of iron per hr. for each inch of horizontal area of the internal diameter at the tuyeres, which is equivalent to 224 sq. ins. per ton per hr.

Silica, or any other refractory brick, or loose material, used for enclosing the melting zone of the cupola should stand a fusion, or refractory, test of not less than 1,700 deg. C.

Gruesome Posters.—Gruesome safety propaganda, such as the exhibition of wrecked cars at roadside spots where accidents have occurred or the display of lurid posters showing fingers severed in a factory mishap, is not suitable for the British public. This is the opinion of Dr. C. S. Myers, Principal of the National Institute of Industrial Psychology, as expressed at the National Safety Congress in London. Fear education of this sort was being used in America and on the Continent to-day, he said. Whilst fear might be a deterrent for some people, the normal reaction of the majority was to become more frightened and consequently more liable to commit errors. He quoted the case of a motorist who, when passing a safety poster depicting a horrible accident, invariably drove badly in sheer panic of impending disaster. For the British public, Dr. Myers considers, safety propaganda should be blended with a light element of amusement, though the fear element should also be present. One industrial safety poster showing a man narrowly escaping a falling girder and bearing the legend "We are not all born lucky," was an excellent example of fear and humour intelligently blended in the interests of safety.

A Distinguished Visitor

MR. A. H. GUY, President of the Transvaal Engineers and Allied Metal Trades Federation, was the principal guest at a luncheon held in the Pinafore Room of the Savoy Hotel yesterday. Mr. H. Winterton, President-designate of the Institute of British Foundrymen, presided.

In proposing the health of the guest, MR. WINTERTON said that Mr. Guy had been in the foundry industry for some nine years. He was managing director of Eclipse Tube Mill Liners, Limited, of Benoni, and specialised in the production of white-iron liners for ball-mill gold-ore crushers. He was also interested in forestry and farming, and was the spokesman for the engineering industries of the Rand for negotiating with the Government on difficult labour problems. He learned with pleasure that Mr. Guy was to participate in the forthcoming Glasgow Conference.

MR. GUY, in reply, gave some interesting details of the political and economic conditions of South Africa. He anticipated that in the next ten years the gold-mining industry would double its present already great size. He deplored the lack of co-operation between the political and industrial elements in the Union. The engineering industry was not protected. It did not compete with European activities but in reality the firms were adjuncts of the mining industry. He promised a warm welcome for any British ironfounder visiting the Union. He very sincerely thanked Mr. V. C. Faulkner, who had virtually met him on arrival, and who had made his visit so interesting from the start. He also took the opportunity of thanking the Ford Motor Car Company; Kryn & Lahy, of Letchworth, and the Ealing Park Foundry for according him permission to inspect their works.

By the time he arrived back in South Africa he hoped to see launched a Branch of the Institute of British Foundrymen, with an initial membership of one hundred and fifty. This, indeed, would afford him more pleasure than any of his other activities. He sincerely acknowledged the real help that had been afforded to him by his membership of the Institute of British Foundrymen, the British Cast Iron Research Association, by THE FOUNDRY TRADE JOURNAL and the Bureau of Information on Nickel.

The F.G.V. Process

The F.G.V. process, which is essentially one relating to the rationalised cupola melting of cast iron, is of German origin. After extensive examination of its potentialities the British rights have been taken over by Robson Refractories, Limited, of 47, Conisciffe Road, Darlington. A feature of the process is that after the tap hole has been opened initially, there is an automatic slag separation, the liquid iron then filling a preheated tilting receiver, in which desulphurisation can be effected. The receiver arrangement keeps back the slag so formed.

The process can be adapted to any reasonably modern cupola furnace and provides a means for the production of refined, desulphurised, slag-free iron under controlled conditions. Arrangements are incorporated for the introduction of either soda ash or alloys. A number of interesting claims are made for the process, such as the use of large scrap percentages in the charge; the lifting of the melting zone to a higher position in the furnace, and the maintenance of a deep slag bath causes the reduction of oxygen compounds in the metal, whilst yielding very hot iron; another claim is that separation of the charges is much more easily effected. The progress of this process will be followed with much interest by our readers. A leaflet has been prepared carrying illustrations of three different plants and a schematic lay-out sectional drawing.

Conference Visitors to Scotland will Inspect these Works

The programme of works visits which has been arranged for participants in the Annual Conference of the Institute of British Foundrymen, opening in Glasgow next Tuesday, is exceptionally well varied. Members will have the opportunity of inspecting the establishments of several famous firms—in Kilmarnock, Johnstone, Clydebank, Renfrew and Govan—manufacturing such diverse products as sewing machines, lathes, boilers, and huge castings for hydraulic and heavy marine engineering. Varied in character though these works may be, each one reflects the efforts of an enlightened and progressive organisation. Some of the works to be visited are described below

Babcock & Wilcox, Limited, Renfrew

FOUNDRIES OF A FAMOUS BOILER WORKS

Iron Foundries

In the old foundry there are at present two 10 to 12 ton cupolas and one 3 ton cupola, but in the general re-organisation of the iron foundries now being made, this old foundry will be converted into a dressing shop and stores. The new iron foundry, when completed with the new extensions now in progress, will be 512 ft. long by 256 ft. wide, arranged in four bays.

In this foundry the existing four 10 to 12 ton an hour cupolas, and one 4 ton cupola which is used for malleable cast iron, will be re-arranged in one line and will have the loading platform extended, and these cupolas will be served by a new mechanical charger. At present two of the larger cupolas have already been converted to the Balanced-Blast system, and it is intended to convert the other two large cupolas in the same way. This will bring the cupolas up to date. With the Balanced-Blast system there is a better distribution of the blast, and this results in obtaining a more uniform temperature of the metal being melted and also in economies in other directions.

In the iron foundry there is an "August's" sand mixing and preparation plant, consisting of two mills, elevator, riddle, magnetic separator and double hopper, so that either dry sand or green sand can be put into either mill. Old sand is treated in this plant, and, after mixing and preparing with fresh sand, it is ready for use in the foundry.

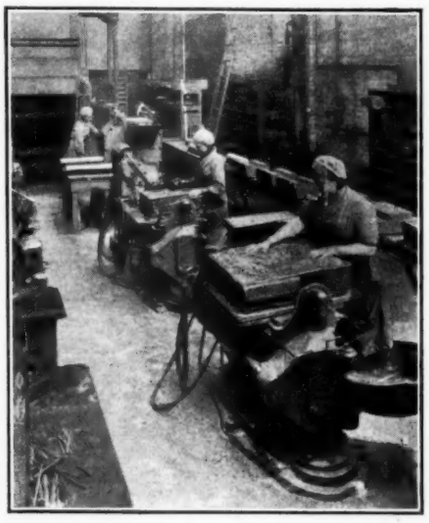
Coremaking Plant

The coremaking plant was recently entirely re-organised; there is a heating and drying drum furnace for the reception of the fresh silica sand, and when the sand passes through this furnace it is elevated and put through another drum so as to cool it. From thence the sand is collected in a skip hoist which empties the sand into a mixing mill, and after the required amount of core oil has been added to the sand, it is thoroughly mixed up in the mill, and, later, is deposited into service bogies from which supplies of the prepared core sand are given to each of the coremakers.

The cores are made by girls who work within two paths of a roller track, each coremaker having a receptacle containing core sand and having the usual coremaking appliances at her command, including special machines for filling the moulds. When the cores have been made, they are laid on plates which are slid on to the roller tracks, this operation relieving the girl coremakers of any fatigue in that no lifting or lowering of heavy weights are necessary. The finished cores, when laid on the trays, slide easily along the roller paths to the drying stove, which is at one end of the double roller paths referred to. Inside this stove there is a travelling conveyor with trays, and the freshly made cores are placed on those trays and they remain on it, going round the drier circuit whilst being dried by hot air continuously. The time taken from entering the drier to leaving same is about 2¼ hours, and the output of the plant can reach to about 6,000 cores per day. Once the cores are removed from the drier, they are cooled off and are then ready for use, and with this plant it is possible to make cores for stock for use when required.

Continuous-Casting Plant

In the new foundry there is installed a large and modern continuous-casting plant consisting



OSBORN MACHINES ARE USED IN THE BABCOCK & WILCOX CORE SHOP.

of a long endless conveyor with cross and other conveyors in connection with the sand mixing and preparing plant erected at one end. Alongside one leg of this conveyor there are nine hydraulic moulding machines having a sand supplying conveyor and hoppers above each machine, the whole scheme being laid out to enable rapid and continuous moulding, pouring and discharging of the sand and castings.

The moulds, after leaving the moulding machines, are placed on the conveyor carriers and they travel to the filling platform where they are filled with the hot metal. Near to the remote end of the conveyor the conveyor carriers are automatically tilted and the moulds, containing the castings, are discharged on to an inclined apron conveyor. The sand and castings travel on, being elevated by this conveyor, and are then discharged on to a shaking grid through which the sand falls on to the cross conveyors beneath the floor level and elevating conveyors. From thence the sand is elevated to the mixing and preparing plant already referred to and from which fresh supplies of prepared moulding sand are delivered to the conveyor over the moulding machines.

The castings, when discharged from the grid at the end of the conveyor, are collected in containers and are removed meantime by small motor trucks to the dressing shop; later it is intended to have a run-way arranged to deal with the castings.

The continuous-casting plant is of a capacity of 550 moulds per hour, and the plant has been put down for the manufacture of chain-grate stoker links. Depending on the design of the link, there may be either four or six link castings in each mould.

It is intended later on to duplicate the continuous moulding plant by installing another conveyor with its complement of moulding machines, etc., and for this purpose the sand-preparation plant has already been installed to enable this duplicate plant to be operated.

Wheelabrator Dressing Plant

The castings from the continuous moulding plant are discharged on to the floor near to the Wheelabrator. The gates and surplus metal are broken off the castings, and the castings are put into the Wheelabrator. This plant consists of a chamber within which is a slat conveyor which raises the castings and cascades them over one another, whilst at the same time a fan creates a strong blast mixed with metal particles which gives a sandblast effect to make the surface of the castings clean.

On an average 8 cwts. of castings are put into the Wheelabrator at each charge, and after the machine is closed up and the blast is turned on it takes about five minutes to clean the surfaces of the castings thoroughly.

Bailey Blocks

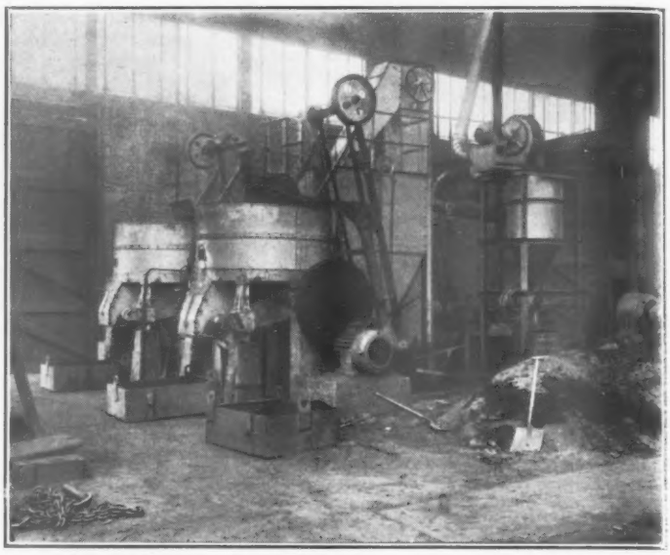
Very large quantities of Bailey blocks, made from a special mixture of cast iron, are now used for furnaces of modern steam generating plants, and a special department of the foundry is devoted almost exclusively to the manufacture of the blocks and clamps required with these. In this section there are special moulding machines, also grinding and machining plant to deal with the large quantity of Bailey blocks now supplied. This part of the foundry is also being extended.

General

In the iron foundries a miscellaneous class of castings is dealt with both as regards shapes and weights. There are no calls, however, for very heavy castings and from 3 to 5 tons weight

In the Foundry of Babcock & Wilcox, Limited, at Renfrew

Balanced Blast Cupolas supply the Metal.



August-Simpson Sand Mills provide the Facing Sand.

A Battery of Hydraulic Moulding Machines feeds the Conveyor.

Roller Pathways are installed for aiding Core Production.

Continuous Casting is practised in the Foundry.

A Wheelabrator Installation takes care of most of the cleaning.

are about the heaviest iron castings called for. The bulk of the castings required, however, are of much lighter weight, these being used for stoker parts, conveyors, cranes, and the very many other products manufactured at the Renfrew works. The iron foundries melt on an average over 600 tons of iron per week and also about 5 tons of malleable cast iron.

Steel Foundry

Like the old iron foundry, the present steel foundry is being completely re-arranged. A large extension is now in progress and ultimately the steel foundry will be 330 ft. long by 75 ft. wide. It will be equipped with three electric furnaces, namely, one of 3 tons and two of 1½ tons capacity. These new electric furnaces will be of the three-electrode type.

At present there are three electric furnaces, one of 30 cwts., one of 23 cwts., and one of 15 cwts. capacity. The two larger furnaces are used for melting the steel, which is of a high-grade quality, generally to suit British Standard Grade A and Grade B requirements, but special melts are made to suit other specifications when called for.

The castings are carefully annealed in gas-fired furnaces, which are kept under constant control as regards temperatures, so as to leave the steel castings in a thoroughly annealed condition. During the steel-melting operations all stages are carefully watched and check analyses are made of each cast.

The small 15 cwt. capacity furnace is used for making special alloys such as "Calmet," which contains a large proportion of nickel and chromium in its composition. The heaviest steel castings produced from this foundry at the present time are round about 15 cwts., and on the average from 30 to 40 tons of steel are melted per week. The steel castings are required exclusively by Babcock & Wilcox for their own use for such purposes as valve bodies and covers, pressure castings for steam ranges, such as tees, bends, etc., also miscellaneous steel castings for crane work and other purposes, including gear wheels, brackets, and castings of a similar nature.

The iron and steel foundries at Babcock & Wilcox's works, Renfrew, are under expert supervision and scientific control as regards the operations of moulding, melting and casting, and their laboratory and research departments are in constant touch with the foundries with respect to all analyses and test requirements. Non-ferrous castings and special gunmetal alloys are not cast at the Renfrew works but at the firm's valve works at Dumbarton.

Glenfield & Kennedy, Limited, Kilmarnock

CASTINGS FOR HYDRAULIC WORK A FEATURE

Glenfield & Kennedy, Limited, were established in 1852 and for the past 84 years have produced plant and equipment connected with hydraulic engineering. To-day the works are the largest in the British Empire specialising in the control of water. The shops cover an area of over 30 acres and employ an average of 2,000 men.

The principal manufactures of the company consist of pumping machinery, hydraulic plant, sluice gates, weir shutters, etc., for irrigation and other purposes, water meters, valves and all classes of waterworks fittings and appliances.

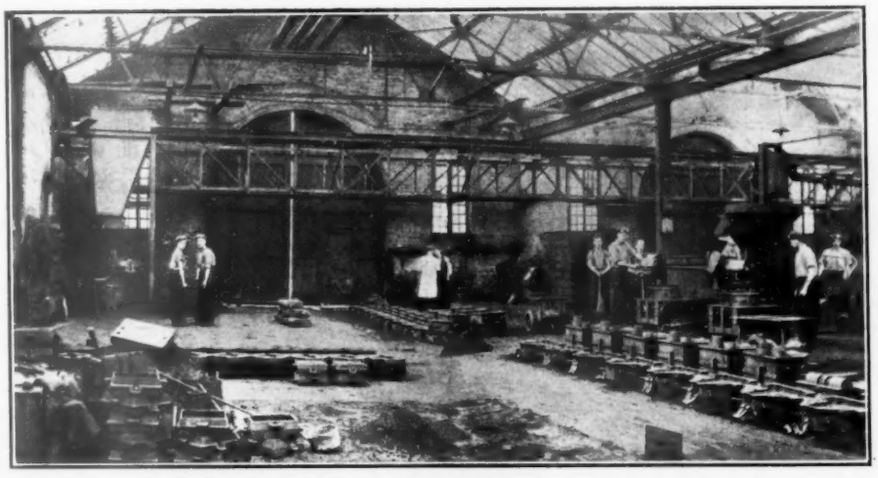
The name of Glenfield is perhaps most widely known in connection with the manufacture of sluice valves, the productive capacity of the firm in this direction alone being 100,000 per annum. The large valves and equipment for controlling the King George V Dock at Southampton, constructed in connection with Q.S.T.S. "Queen Mary" are of Glenfield manufacture.

Iron Founding

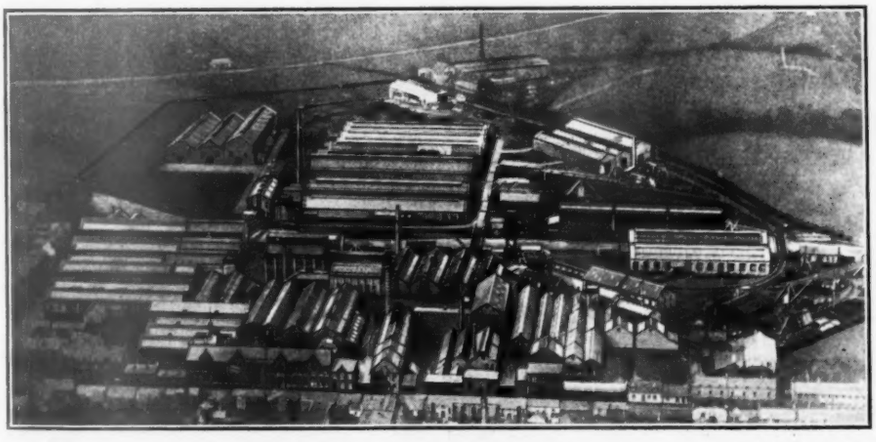
Two modern foundries are employed for the production of grey iron castings. The light foundry makes mass-production castings in green sand, having an average weight of about 2 cwts., and the heavy foundry produces large castings in dry sand and loam up to 30 tons and over. The weekly capacity of the foundries is 400 tons.

In the light foundry the bulk of production is obtained by machine moulding whilst in the heavy foundry extensive use of a Sandslinger is practised. All the moulding sands used are under routine control and in the case of the light foundry supplied from a modern central sand-treatment plant.

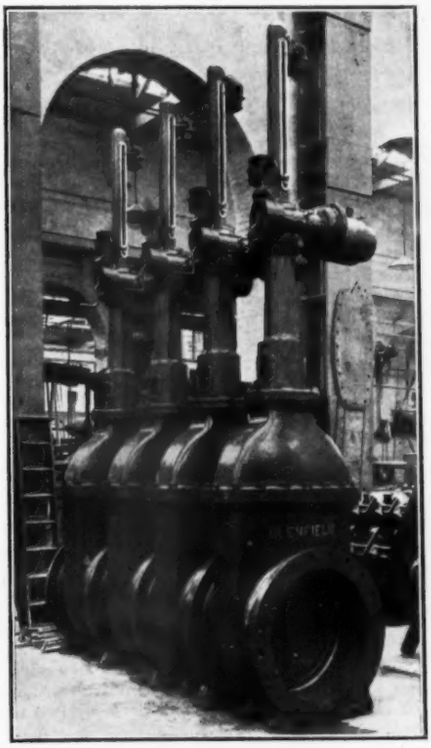
The foundries are serviced by a battery of four cupolas, fitted with automatic charging, and one tilting crucible furnace for special



CORNER OF THE LIGHT FOUNDRY OF GLENFIELD & KENNEDY, LIMITED.



AT GLENFIELD & KENNEDY'S WORKS THERE ARE 2,000 EMPLOYEES ENGAGED IN 30 ACRES OF SHOPS SHOWN IN THIS AERIAL PHOTOGRAPH.



LARGE ELECTRICALLY-OPERATED SLUICE VALVES—A TYPICAL PRODUCT OF GLENFIELD & KENNEDY.

alloys. In view of the many corrosion problems associated with hydraulic engineering it is natural that Glenfield & Kennedy have taken full advantage of alloy cast irons, and a considerable tonnage of austenitic, nickel, nickel-chrome and copper-chromium irons is produced.

The General Engineering Shop of Glenfield & Kennedy, Limited.

The major portion of cores employed are produced from oil-sand in a large core shop adjacent to the light foundry. Most of the cores are made by hand by girl labour and a core-blowing machine has been recently installed.

Brass Foundry

In regard to non-ferrous alloys a weekly output of between 15 and 20 tons of small castings is produced embracing aluminium and manganese bronze, brass, gunmetal, nickel silver and special nickel bronzes. Castings are made in both green and dry sand and the majority have to resist water pressure. In certain instances test pressures up to 3,000 lbs. per sq. in. are employed which calls for particular care in casting manufacture.

Metal is melted in crucible furnaces of both the pit and tilting type and employing both coke and oil for fuel. At the present time this department is being modernised and extended.

Patternshop

An exceptionally well-equipped and modern building is available for the manufacture of patterns for both the iron and brass foundries and also to cater for the large output of steel castings purchased to special designs. One of the latest Wadkin Universal wood-working milling machines fitted with joy stick control is operating in this department.

Laboratory

Glenfield & Kennedy, Limited, are fully cognisant of the value of research and scientific control in the production of their manufactures and consequently the laboratory building is particularly modern and well equipped. The building incorporates a machine room and routine sand testing department, physical testing room, chemical laboratory, metallographic and balance room, dark room and the usual offices.

Machine Shops

The engineering shops are amongst the finest in Great Britain, involving heavy and light machine and fitting shops equipped with the most modern machine tools. Particular attention has been given by the management to cleanliness, the provision of ample working space and the arrangement of plant and equipment to meet production requirements.

All the works are heated during winter by warm air and the same equipment circulates cool air in the summer months.

John Lang & Sons, Limited, Johnstone

A PROGRESSIVE MACHINE-TOOL MANUFACTURING CONCERN

The firm of John Lang & Sons, Limited, was founded in 1874 by the late ex-Provost John Lang, sen., together with his two eldest sons, John and Robert. Later, two other sons, James and William, joined the firm. All four sons remained in the business, and with their father succeeded in establishing a world-wide reputation for advanced machine-tool design of high quality. Business was started in a comparatively small building in Johnstone, measuring some 120 ft. by 40 ft., and about ten men in all were employed making general machine tools. To-day the works cover about 6 acres, the machine, fitting, and erecting shops alone occupying some 3½ acres, while the number of employees has increased to 1,000.

An aerial photograph of the present works is shown herewith. The machine, fitting and erecting shops are seen in the foreground at the left-hand side, and the foundry, pattern shop and pattern stores are seen on the extreme right. A railway siding connects the foundry with the main line, affording facilities for receiving raw materials. A view of the interior of the machine shop is given on page 439, this being a bay in the surfacing and boring department.

At the time John Lang & Sons started business, the machine-tool industry was well established. Many improvements had been made on the early machines originated in London by Maudslay & Roberts, amongst other, and screw threads had been standardised by Whitworth. But much development work remained to be done. Machines were still being made with cast gears, and the chatter caused by inaccurate teeth was often found to be transferred to the work piece being machined. Furthermore, the range of speeds and feeds provided was very limited, and it was generally necessary to stop the machine to change either the speed or feed. Moreover, the cutting speeds were low and the degree of accuracy attained left much to be desired.

American machine tool makers were already busy. They had been quick to realise the possibilities of the machine tool. In 1882, only eight years after starting in business, Langs heard of a new automatic gear-cutting machine being made in America, and John Lang, jun., the designer to the firm, went over to investigate. His report was so satisfactory that the firm promptly bought one of the new machines from Gould & Eberhardt, U.S.A., installed it in its own workshops, and began cutting gears and fitting them to all the machines they made. This machine proved to be the first automatic gear-cutting machine installed in Europe, and so great was the interest it created, that people from all parts of Europe came to see it in operation. Thus Langs became the first firm on this side of the Atlantic to fit machine-cut gears to machine-tools. As may naturally be supposed, this enterprise gave a tremendous advantage to the firm, and made it known to many people all over the world.

An Aerial View of the Works of John Lang & Sons, Limited.

The decision to specialise in lathes soon proved to be a wise one. New models, having distinctive

and novel features, followed very quickly. At the same time, general design and improvement in detail to facilitate operation received attention. One of the important developments, following close on the introduction of machine-cut gears, was the short bed, surfacing and boring lathe, made without the usual loose headstock. The first of these machines was built during the year 1881.

The features in the original Lang surfacing and boring machine were probably more important than was at first realised, and though at this date it may be difficult to say precisely how far or to what extent it influenced designs that followed, it can be said that so far as can be ascertained Langs were the first to design and construct a lathe for the express purpose of carrying out the operations of surfacing and boring, and that it was the first engineers' lathe designed to dispense entirely with the loose headstock. It may therefore be claimed that the original "Lang" was the prototype of the capstan and turret lathes that followed. Here, then, is a real and substantial contribution to the art of machine tool design; a machine made for a purpose, and with a definite end in view, but which, in the process of evolution, becomes of almost universal application in the machine tool industry.

In a relatively short article, as this necessarily must be, it is only possible to deal with a firm's major achievements. The mass of improvement in details can only briefly be dealt with. But particular mention must be made of another of the firm's inventions, widely known as "Lang's variable speed drive." Many machines have been fitted with this type of drive.

A whole battery of surfacing and boring machines with the variable speed drive is seen above, this being from a photograph of one of the bays in the firm's machine shop. The specially constructed belt with the bevelled edge driving between the V pulleys, formed by a pair of cones on each side of the headstock, can be seen in the engraving, particularly on the left-hand side.

A patent for the variable speed drive was taken out in 1900. It is acknowledged by many machine-tool makers that it was the origin of the modern all-geared headstock, so much in evidence to-day on many types of machines. The drive has been fitted to other types of lathes, and in the machines of the 1920 period the bevelled edged belt is practically completely covered, much in the same way as the all-geared head. With the Lang variable speed drive a constant cutting speed can be maintained when facing large wheels or discs, the revolutions of the work piece increasing automatically as the tool travels from the periphery to the hub.

A VIEW IN THE MACHINE SHOP OF THE WORKS OF JOHN LANG & SONS, LIMITED.

The Foundry

Naturally, the visitors will be most interested in the foundry department, which has a monthly output of finished castings of about 200 tons, the heaviest being in the region of 6 tons with a maximum length of 33 ft., whilst the smallest will weigh but 8 ozs. The average is of the order of 56 lbs. Metal is supplied by 45-in. and 32-in. cupolas arranged for continuous tapping. They are both of the Balanced Blast type and the plant was described by Mr. W. Y. Buchanan in our issue of January 16 this year.

Metal is fed to the cupola staging by a 5-ton capacity electric jib crane using 3-ton skips. The cupolas are hand charged and the liquid metal is handled across the foundry by bogie trucks and along it by 10-ton electric overhead travelling cranes. The shop is 240 ft. long by 150 ft. wide, divided into eight working bays, each serviced by an overhead electric traveller, six of these are of 10 tons, one of 15 and one of 20 tons capacity.

For mould drying, there are three forced-draft bogie-loaded stoves, two of which have a capacity of 24 ft. by 12 ft. by 10 ft., whilst the third is slightly smaller. The stoves are pyrometrically controlled. In the core shop there is a smaller installation. The facing sand is prepared in an August's No. 2 de-silting, magnetting and mixing plant which has a capacity of 24 tons per day. In the core shop, the most notable features are a Coleman Revolver core-blowing machine and a Rotoil mixer.

There are four belt-driven carborundum wheels and a 9-ft. rumbling barrel installed in the fettling shop.

A complete chemical control is maintained over all raw materials, whilst analyses of every lathe bed are made as well as daily samples from the ladles of metal destined for general castings not subject to wear. A well-equipped laboratory has been installed, which, in addition to such apparatus as a Vickers projection microscope, hardness testing machines, includes a complete department for the testing of foundry sands.

Follsain Metals, Limited

ISSUE OF PREFERENCE SHARES

An issue of 250,000 6 per cent. cumulative participating preference shares of 10s. each at par of Follsain Metals, Limited, was made recently.

The company has an authorised capital of £200,000, of which £165,550 is issued or to be issued, and was incorporated in 1934, being formed to operate in Great Britain and Ireland on a royalty basis the Follsain processes for the treatment of iron and steel products protected by letters patent or provisional applications owned by Follsain Syndicate, Limited.

The Follsain "Penetral" process has three chief variants according to the mixture employed. First, the Follsain "HT" process yields a metal highly resistant to oxidation, and to corrosion by sea water and certain other liquids; next, the Follsain "SH" process gives a very hard surface, highly resistant to abrasion; lastly, the Follsain "AR" Process yields an alloy hardly touched by the attack of molten zinc and tin. The outstanding success of the "HT" process is the impregnation of mild steel tubes for heating air, gas, or liquids to temperatures up to 800 deg. to 850 deg. C. The temperature of the combustion gases or other heating medium employed may reach even 1,400 deg. C. provided that the temperature of the metal tube itself does not exceed 1,000 deg. C. to 1,050 deg. C. Such tubes are required for air heaters, recuperators, oil-refining, pyrometer sheaths, soot blower elements, air and gas ducts, etc.

The prospectus claimed a wide field for the "HT" process apart from tubular products, for instance, for annealing, carburising and other boxes and pots: for burners, ladles, baffle plates and other furnace fittings and furniture. The "SH" and "AR" processes, while giving promising results, are not yet fully developed commercially. Follsain "EVH 1" metal is a heat-resisting metal unaffected by oxidation up to a temperature of 1,175 deg. C. It is the result of an entirely novel process, provisionally protected, which produces an exceptionally clean and sound metal. It can be made at a lower cost than alloys of equivalent heat resistance. Its outstanding features are great strength and low rate of creep at high temperatures. It can be cast and machined to any desired form and used without fear of any material distortion. "CY" metal is a metal manufactured especially for parts subjected to heavy wear and abrasion. Locomotive and tramway brake blocks of this metal have given astonishing results. The company has agreed with a firm of ironfounders, who are amply provided with the necessary facilities, that they shall take up this section of "CY" production on an equal profit-sharing basis. Experience has demonstrated that this metal is also suitable for crusher parts, shutes, ball-mill liner plates, pump parts and parts for mining, crushing, brick and tile making and other machinery where there is an absence of considerable shock. The company proposes to meet the requirements of these trades from its own works.

The directors of the company are Mr. A. H. Pollen (director of Birmingham Small Arms Company, Limited), chairman and managing director; Col. C. F. Hitchins (director, Partington Iron & Steel Company, Limited, and Skinningrove Iron Company, Limited), deputy chairman; Lt.-Col. the Hon. Oliver Stanley; Mr. G. C. B. Taite (managing director, Wycliffe Foundry Company, Limited); and Mr. Guy Barrett (director of the Wycliffe Foundry Company, Limited), joint managing director.

British Oxygen Company's New Offices

The British Oxygen Company's new head office at Thames House, which our representative had an opportunity to inspect last week, is symbolic of the great progress made by this company from modest beginnings fifty years ago. From 1886 to 1921 the head office of the company was situated at the premises in Horseferry Road, where the company's first plant was installed for the production of oxygen. In 1921 the head office was transferred to the building, then newly erected at Edmonton, which to-day houses the company's extensive plant for the production of machines and equipment for use in applying, to the needs of industry, the gases produced in its numerous factories throughout Great Britain and Northern Ireland and the Dominions. In 1933 the head office was again removed to the more convenient centre of Westminster, where it was established at Victoria Station House in commodious and well-appointed offices which had for many years been occupied by Allen-Liversidge, Limited, merged with the British Oxygen Company in 1931. Now, the great growth of this company, particularly during the last three years, has dictated a move to still larger premises. No more suitable site could have been chosen for this purpose than Thames House, which is among the most modern office buildings in London.

FIG. 1.—VIEW OF GENERAL OFFICE: BRITISH OXYGEN COMPANY, LIMITED.

FIG. 2.—VIEW OF BOARD ROOM: BRITISH OXYGEN COMPANY, LIMITED.

The office comprises a general office and some 50 private rooms for the housing of directors, managerial and assistant managerial staff. The private rooms are arranged round three sides of the floor and have been designed with a view to the maximum illumination both for their occupants and for the clerical staff in the general office. All these offices are provided with large windows on the outside, and glass partitions placed laterally and giving on to the general office in the centre of the floor. Thus, it is easy for any occupant, without disturbing a colleague, to see at once whether he is engaged in dictating to a typist, speaking on a telephone, interviewing a caller or disengaged and available for consultation. At the same time, this system permits the best possible illumination, not only for those members of the staff for whose work a private office is desirable, but also for the clerical staff in the general office for whom light is thus provided through the panes of the private offices surrounding them, and through the lofty windows giving on to the central "well" or courtyard of the building. These partitions are glazed with plate glass in order to minimise noise and to avoid distortion of vision.

It will be obvious that the company's administration has done everything possible to enhance the convenience and pleasant conditions of work of their staff. As to their meals, Thames House Estate has provided facilities embodied in luncheon rooms, grill room and cafeteria. Situated within the house there are facilities for recreation, including a well-appointed swimming pool.

The new board room is one of fine proportions, well lighted and well equipped. A committee room, near the board room, is available for the use of staff committees which meet from time to time for the purpose of encouraging mutual co-operation between departments.

Luncheon at Grosvenor House

The British Oxygen Company, Limited, last Thursday celebrated the 50th anniversary of the foundation of the company by throwing open to inspection these new offices at Thames House, London, and by inviting all their friends to luncheon at Grosvenor House. This function was presided over by Dr. J. Donald Pollock, the chairman of the company, and the principal guests were Lord Melchett, Lord Alness and Sir Malcolm Campbell, who were amongst the speakers. Other directors of the British Oxygen Company present were: Mr. S. J. L. Hardie; Mr. P. B. Liversidge; Mr. E. W. S. Sprott, and Mr. C. Dunbar.

Amongst those present prominent in the foundry industry were: Mr. J. M. Aiton (Derby); Brig.-Gen. Sir Harold Hartley, C.B.E. (Past-President, British Cast Iron Research Association); Vincent C. Faulkner (Past-President, Institute of British Foundrymen and Editor of THE FOUNDRY TRADE JOURNAL); Mr. A. B. Harrower; Sir William Larke, K.B.E. (Director, British Iron and Steel Federation); Mr. C. Lamb; Dr. A. McCance; Mr. William Reavell (Ipswich); Mr. G. B. Taverner; Mr. L. J. Tibbenham; Mr. W. Rawlinson (Manchester); and Sir Alexander Gibb (President of the Institute of Welding).

Lord Melchett, replying to the toast "The Visitors," proposed by Mr. P. B. Liversidge, said that the British Oxygen Company had made tremendous progress from a capital of £75,000 to its present status of £3,500,000. It was one of the most advanced scientific companies of our time, and had done a great work in advancing knowledge in its own particular industry. The company had extended their organisation throughout the British Empire and were an example in bringing together the industrial power of the different parts of the Empire. He hoped that what they had done would be energetically pursued by this and other Governments of the Empire, which was capable of tremendous development by the application of scientific knowledge combined with common sense.

Higher Steel Prices

FIRST CHANGE IN HEAVY PRODUCTS SINCE 1929

Announcement of an increase in prices was made following a meeting of the heavy-steel makers in London on May 29. Home trade prices for controlled ship, boiler and chequer prices have been raised by 12s. 6d. per ton as from May 28, and medium plates by 10s. per ton. Existing export prices were confirmed.

This is the first advance in heavy-steel prices since 1929. The increase has been forced on makers by the rising costs of production due to dearer coke, pig-iron and scrap. The advance was delayed as long as possible, but it was generally recognised that an increase had become inevitable.

Prices of soft, untested billets have also been raised recently. The increase is 5s. per ton, which carries with it an advance of 6s. in small steel bars, hoops and strip.

Other price increases announced last week are in basic pig-iron, which is higher by 2s. 6d., and in hematite, which has been raised by 3s. 6d. per ton.

THE DATE of the official inauguration of the new centrifugal iron-pipe plant at the Ormesby Ironworks of Cochrane's (Middlesbro') Foundry, Limited, by the Marquess of Londonderry, has now been fixed for Friday, June 12.

Practical Sand Control in Grey-Iron Foundries*

By H. A. DEANE

There are two principal and interrelated factors in the production of castings that are sound and free from surface defects. The more important factor is moulding practice, which may not be any more reliable than the human element; the other is sand control. There is no mystery or complicated process involved in sand control. It is merely an easier and more exact way to obtain the proper sand and be certain that the sand is prepared and maintained in uniform condition when supplied to the moulders. By using figures instead of guesswork, permanent and accurate records can be obtained. Sand control in the core room is also valuable but will not be discussed here because the purpose of this Paper is to give some of the practical aspects of the benefits of controlling the variable properties of moulding sand.

Personnel and Scope of Duties

Anyone of average intelligence can be readily trained to do the routine sand testing. The use of apprentices for this work seems to work out advantageously both for the foundry and for training the younger men. However, after the tests have been made and recorded, this information must be applied. Someone, preferably with moulding experience, should correlate the sand test results with the condition of the castings made in it. This man may be either the foundry metallurgist or the moulding foreman. It is very important and beneficial to have a daily meeting of the moulding foreman, cleaning-room foreman or inspector and the man responsible for the sand control. This meeting may be either formal or informal, but some means of exchanging information as to the condition of the castings and methods of overcoming difficulties must be provided. Not only will plans be evolved for overcoming sand defects but also methods for eliminating scrap castings.

The sand control laboratory will be of value in selecting new sands. Here again it has been found that the best test of a new sand is practical use in the foundry. Experience is the best teacher, but it may also be the most costly. Therefore any help that the sand laboratory can give should be welcome. Tests should be made for fineness and clay content. This will be a guide in determining the type of sand. If the new sand seems suitable, a practical test should be made in the foundry by using this sand in comparison with the sand in use. The sand laboratory can follow these tests and collect the data. At present there are no standard laboratory methods for obtaining the durability of the sand, but it is probable that an accelerated test will be evolved in the near future.

Consignments of new sand should be checked for fineness and clay content by the sand laboratory to make certain that a uniform material is being supplied. It has been found that such a procedure has a salutary effect on the supplier. The sand laboratory should make the tests for moisture, permeability and strength of the different sands in use and keep daily records. The number of tests made on each sand heap or unit depends on the size of the heap or the number of times it is used per day. A convenient mimeographed sheet, such as the one outlined in Fig. 1, can be used for recording the daily tests and the additions made.

Records should also be kept of the various batches of facing that are made up. All records should be available to the moulding foreman so that the closest co-operation possible will exist between the sand laboratory and the moulding department. By means of these records and their correlation with the condition of the castings, definite standards of moisture, permeability and strength can be set up and maintained. The moulding foremen will find these figures to be increasingly valuable in correctly placing the blame for defective castings and in suggesting means of overcoming moulding difficulties. The actual reduction in defects and undesirable surfaces on castings will be surprising.

Moulding Sands

The number of moulding sands required in a production foundry depends on the variety of castings produced. The moulding practice and equipment will also influence this. No more than three grades of sand should be required in a foundry, and often this number can be decreased if the moulding practice is adjusted to it. The following grades of sand and their characteristics are used successfully in the larger foundries of the firm with which the author is connected.

Sand for Use with Sandslingers

For castings weighing up to 1,000 lbs., and made on Sandslingers, synthetic sand composed of Ottawa silica sand and a clay or bentonite bond is generally used, because it is easier to prepare a synthetic sand than it is to secure an acceptable natural sand. This heap sand is maintained within the following standards which have been set up because past experience has demonstrated that these are best suited to the production of good castings:—Moisture, 4.5 to 5.5 per cent.; permeability (A.F.A. Number), 80 to 100; compression strength, 7.5 to 8.5 lbs.

BLANK CO.

Sand-Testing Laboratory.

Date.	3/2/36.				3/3.				3/4.			
Floor no.	M.	P.	S.	Additions.	M.	P.	S.	Additions.	M.	P.	S.	Additions.
35	*6.5*	*23*	*6.6*	*None*	*6.7*	*20*	*6.2*	*400 lbs. B.O.*	*6.3*	*25*	*6.8*	*None*
36	*6.9*	*35*	*6.9*	*200 lbs. R.L.*	*7.0*	*38*	*6.4*	*200 lbs. R.L.*	*7.0*	*39*	*6.7*	*None*

FIG. 1.—FORM USED TO RECORD DAILY TEST RESULTS AND ADDITIONS MADE.

For castings weighing from 100 to 300 lbs. and made on heavy jolt-strip machines or on the floor, either a synthetic bonded silica sand or an open natural sand is used. Due to the variations in castings made, the spread in specifications is rather wide, with the smaller castings being made in the finer sand. The following ranges seem to be suitable for the above castings:—Moisture, 5.5 to 6.5 per cent.; permeability (A.F.A. Number), 45 to 70; compression strength, 6.8 to 8.8 lbs.

Sand for Castings 1 to 100 lbs.

Castings ranging in weight from 1 to 100 lbs. are usually made on the bench or with squeezers and natural sand is used. Sometimes, when an excessive amount of core sand finds its way into a heap, a clay bond is mulled in to maintain the strength. However, it is not advisable to use a completely synthetic bonded sand for this class of work because there is too much flowability for the usual moulding practice. Here again, there is a wide range in the sand test standards to cover different castings because of the wide variations in jobs. Ranges which are suitable for this type of castings are as follow:—Moisture, 6 to 7 per cent.; permeability (A.F.A. Number), 18 to 40; compression strength, 6.0 to 7.5 lbs.

Sometimes for very small castings or where a particularly smooth surface is required, the permeability may be reduced below that shown above by using sand with a finer grain size. Another method is to mull in a small addition of coal dust at periodic intervals. The present tendency is towards using sand with lower moisture and harder ramming, which gives smoother and more nearly true castings.

Sand Additions and Preparations

Natural sand additions are usually made by adding the raw sand to the heaps whenever the strength demands. It is far better to make frequent small additions than to allow the bond in the heaps to become too low and then add a large quantity of new sand. Daily sand tests will show when there is need for more sand to be added, and this should be controlled by the sand laboratory.

When the clay bond in the heap sand is maintained consistently at 8 to 12 per cent. the best moulding results are obtained. This will vary somewhat depending on the bonding value and durability of the clay, but the amount of clay bond should be kept as low as possible as an excess in the heap will reduce the permeability and cause defective castings. The most efficient method of adding new sand is to mull it with about an equal volume of heap sand before spreading on heaps. However, if this is not possible, the alternative is to cut the new sand into the heap before the water for tempering is added. This procedure will distribute the new bond more thoroughly through the used sand and prevent the formation of clay balls.

Aeration.—The use of an aerator will be found to be valuable as an aid to the sand cutter in preparing the sand heaps. The aerator acts as a mechanical riddle in fluffing up the sand and in removing core butts, tramp iron, etc. It also aids in producing a uniform sand condition by its mixing action. There is a need in the foundry for an aerator that will convey the sand to it when it is used on the sand heaps.

Synthetic Sand Additions.—To obtain the most economical and efficient strength and permeability in synthetic sand additions, the mixture must be mulled with a small amount (1.0 to 2.0 per cent.) of water before adding to the heaps. Usually these additions are made of two parts of silica sand, one part of clay bond and about one part of coal dust. These additions should be spread evenly on the heaps daily and in proportion to the requirements as shown by the daily sand tests. The physical properties of a synthetic sand fluctuate more rapidly than natural sand. Therefore it is more important to make frequent tests on the synthetic sands. It is comparatively easy to vary the strength in this type of sand and to lower the permeability, but increasing the permeability of the sand is a much more difficult proposition. Also, the moisture content in synthetic sand is much less stable than in natural sands. Therefore the price of good synthetic sand is continuous vigilance. Occasionally a much used heap of synthetic sand will be satisfactory when tested by the sand laboratory, but will feel lifeless, and there will be considerable difficulty in moulding. This condition usually occurs in sand that has had large coal dust additions. It may be overcome by adding natural sand or by allowing the heap to be idle for a time.

Moisture Content.—Possibly the most important single property of moulding sand is the moisture content, yet it has been the most

* From a Paper read at the Annual Meeting of the American Foundrymen's Association in Detroit recently.

neglected. The reason for this is that to obtain the correct temper considerable skill and experience is required. Furthermore, in the past, the moulder's judgment was the basis of judging whether a sand was tempered correctly. An experienced moulder would make allowances for variations in temper by controlling his ramming, venting, etc. In these days of high production moulding and with fewer skilled moulders available, some means of providing uniformly tempered sand must be provided. There are moisture testing devices available that will give accurate results quickly. Keeping the moisture of the sand at the lower limit of workability is very desirable because cleaner and fewer defective castings will be obtained.

Present-day production moulding demands uniform and correct sand temper, permeability and strength, and the sand testing laboratory can be of inestimable value in obtaining these conditions. It is thought that the moulding sand testing should be done during or soon after the heaps have been cut over so that the sand preparation men may be guided by the test results.

Facings

In sand-handling systems, the usual practice is to condition all the sand in such a manner that facing is unnecessary, but in foundries where there is no central sand-handling units the facing is usually mixed and mulled in special units. It has been found that fluffing the mulled facing with an aerator is worth while. As this facing is to be next to the casting, it is important that the correct moisture, permeability and strength be maintained in every batch. Therefore, frequent tests should be made to assure proper control and records kept so that reference can be made to them after the castings are poured. Probably the most successful facing mixtures are composed with a base of heap sand plus coal dust and any additional bond and "opener" sand that may be required. The best results will usually be obtained when the permeability of the facing mixture is lower and the strength is higher than the backing sand.

Each foundry has its own particular facing mixtures, but perhaps some of those shown in Table I may aid in overcoming problems in other foundries.

TABLE I.—*Facing Mixtures.*

(Volume measurement.)

Type of facing.	A	B	C	D	E
Heap sand ..	30	46	42	43	40
Silica sand ..	7	4	—	7	7
Natural sand	—	—	7	—	—
Clay bond ..	9	½	—	—	—
Coal dust ..	9	4½	6½	5	8
(Test data.)					
Moisture, per cent. ..	4.5–5.0	4.5–5.0	4.5–5.0	6.0–6.5	6.0–6.5
Permeability	45–60	45–60	45–60	25–30	10–18
Compression strength, lbs.	12–13	8.0–9.5	8.3–9.6	7.5–8.5	8.0–10

A—For 500–900 lbs. castings made with Sandslinger.
B—For 100–300 lbs. castings made with Sandslinger.
C—For 100–300 lbs. castings made with jolt-strip moulding machine.
D—For general bench and squeezer work.
E—For small castings demanding very smooth surfaces.

The developing of suitable facing mixtures is the duty of the moulding foremen, but the sand laboratory should work very closely with them. After acceptable mixes have been established, it is up to the sand department to maintain them.

THE ARGENTINE GOVERNMENT has approved expenditure of 300,000,000 pesos (about £16,700,000) for the completion of the railway network scheme by 1942. An agreement has also been reached between the Government and the railway companies removing obstacles which have stood in the way of railway development.

District Presidents.—No. 2

SCOTTISH BRANCH OF THE INSTITUTE OF BRITISH FOUNDRYMEN

MR. FRANK HUDSON, President of the Scottish Branch of the Institute of British Foundrymen, is chief metallurgist with Glenfield & Kennedy, Limited, the well-known firm of hydraulic engineers, Kilmarnock.

Mr. Hudson was educated at Rutherford College, Newcastle-upon-Tyne, and holds a first-class certificate in iron and steel manufacture from City and Guilds of London Institute. He served his apprenticeship with Sir W. G. Armstrong Whitworth & Company, Limited, as a metallurgist on armament and general engineering work, and at the age of 20 was given his first executive position as melting manager at the Close Works Iron Foundry of that firm.

In 1924 he was appointed metallurgist to the Government of Tibet to supervise the installation and manufacture of electric steel at Lhassa,

MR. FRANK HUDSON.

but was advised at the last minute by the British Government not to go out due to religious unrest in Tibet. The expedition and machinery came to a very untimely end, as the convoy was massacred and the hydro-electric plant and furnaces destroyed. From 1925 to 1927 he resided in Canada and the United States, and was associated with American Brake Shoe and Foundry Company, Chicago; Warren Foundry and Pipe Company, Phillipsburg, New Jersey; and latterly as metallurgist and assistant superintendent with Wyoming Shovel Works, of Pennsylvania.

In 1927 Mr. Hudson returned to this country to become associated with Glenfield & Kennedy, Limited, leaving them in 1929 to start up the new laboratories of the Fordath Engineering Company, of Glyso fame, in West Bromwich. In this latter position he came into contact with most of the foundries in the British Isles.

Mr. Hudson is also an active member of the American Foundrymen's Association and the Institute of Metals, and a past member of the American Society for Steel Treating. During the past few years he has contributed many Papers to various technical societies, and perhaps his work on moulding sands is most widely known, having been presented with the Institute of British Foundrymen's Diploma on two separate occasions for Papers on this subject.

Difficult Days in Tin

BY "ONLOOKER."

If the tin situation had been tackled in the right way last summer, when the famine for spot metal was at its worst and conditions on the Exchange were chaotic, consumers would not to-day be facing a state of affairs, which, if it were not so serious, might almost be labelled grotesque. For Britain, the centre of the tin world as far as daily trading is concerned, to be down to about ten days' supply of the metal certainly seems to be ludicrous, but those are the facts and at the moment there does not seem to be much prospect of any change in the situation. A year ago the stocks were over 5,000 tons and sufficient for six weeks, while in 1934 there were reserves to cover a couple of months or so, but times have changed—for the worse.

The conduct of affairs by the International Tin Committee has been the subject of much harsh criticism from various quarters, and without entering into the rights and wrongs of the manner in which things have been done it must be confessed that the warmest admirers of the Committee would hardly award much praise for foresight. However, for better or for worse, the I.T.C. is in control and consumers have got to make the best of it.

The London Metal Exchange, with a commendable realisation of its duty to the community as well as to the trader, recently addressed to the Colonial Secretary a memorandum on the subject of the dangerous position of the country in relation to tin stocks, but Mr. Thomas in his reply did not give any encouragement that Government action would be taken. It seems regrettable that after attention has been drawn to an obvious danger by a body which is in the position of knowing all the facts of the case, nothing should be done to avert what may prove to be a disaster, for tin is a highly important metal both in war and peace. Possibly the recently appointed Minister of Defence may in due course decide that some action must be taken, or perhaps the International Tin Committee may itself come to the conclusion that attention should be given to a plan for building up stocks to a reasonable and safe level. Opinion probably differs about what constitutes a proper stock, but bearing in mind that there is always the chance of metal being withdrawn for shipment to America at very short notice, it would seem that something in the neighbourhood of 5,000 tons ought to be stocked.

From the point of view of the buyer the market situation is not quite so bad as it was, although bad enough, for the premium for cash is still around £4 to £5 per ton. This is certainly not satisfactory, but it is not so bad as £20, which was recorded at one time last year and virtually put the tin market out of commission altogether. To some extent buyers are getting used to a thoroughly bad state of affairs and are doing their best to circumvent this by buying forward in order to take advantage of the lower price. This is all right provided that the purchaser's consumption of tin is on an established basis which permits of accurate estimation of forward needs, but obviously a trader does not want to have metal on his hands at risk of market fluctuations. Experience of course enables a manufacturer to know pretty well how his orders are going to come in, so that the chances of loss are reduced, but obviously it is outside a manufacturer's province to take any action savouring of gambling.

THE LAST DAY for receiving proofs in connection with a dividend to be paid by Mr. E. A. B. Coxhead, 11, Wallwood Road, Leytonstone, metal founder, is June 6 next.

Colouring Troubles in Vitreous Enamels

Mr. W. G. Ball's Paper on "How Colouring Oxides are affected by Variations of Enamel Composition," which was printed in our February 6 supplement, gave rise to a discussion which was full of useful hints. It was opened by MR. J. H. COUPE (London), who remarked that the low fusing enamel referred to by the lecturer which could be satisfactorily fused at a temperature of 750 deg. C. was not suitable for all purposes, especially in cases where the finished article was subjected to heat. For instance a low-fusing enamel was not satisfactory for the inside lining of an electric oven.

Colour and Heat-Resistance

MR. BALL said he was afraid he had overlooked the question of heat-resistance. Obviously, unless the enamel was originally fired at a high temperature it would not have the same heat-resistance. He had given more attention to the effects of wear and tear rather than heat-resistance applied to a certain part.

MR. COUPE remarked that the percentage of tin in one particular oxide mentioned by Mr. Ball appeared to be very high. Was this not detrimental in cases where it was necessary to produce an acid-resisting enamel?

Pink Oxides

MR. BALL said that in the case of the pink oxide example exhibited, the tin was actually part of the colouring base. Its final composition was not tin oxide by any means. The pink oxide was very rarely used straight on the iron, but although it contained such a high percentage of tin oxide he did not think it would have any disadvantageous action on the enamel from an acid-resisting point of view. Dealing with the question of acid resistance, and the effect which oxides had on acid resistance, it was very difficult to make a general statement. One could only make a statement as it applied to a definite oxide in a particular acid-resistant or acid-proof frit. The acid-proof series of frits was comparatively new. He did not think there were two acid-proof, or acid-resistant, frits made by different makers which had the same characteristics. For instance, a sheet-iron clear frit made by five different works would show characteristics which as far as general type was concerned were practically identical, but they would vary in details. One might withstand more firing, and another might develop a colour better. A similar observation would apply to ordinary "soft" cast iron enamels. They had been made long enough for the general tendency to be very similar, but he did not think that the present type of acid-proof or acid-resistant enamels had been made long enough yet for there to be any general uniformity. He thought that if anyone made a general statement with regard to oxides in acid-proof enamels they could only make the statement as regards the oxide in a particular enamel and not as regards acid-proof enamels in general.

Colours and Acid-Resisting Enamels

MR. J. E. FOSTER (Stoke-on-Trent) said that, from the experience he had had during the short time he had been having anything to do with vitreous enamelling, and especially with acid-proof enamels, he had found that an increase of tin oxide would certainly reduce the acid-proof qualities. Furthermore, in the case of sprayed enamels, the enameller depended upon the clay content for suspension, which would tend to reduce the acid-resistance of those enamels. Regarding the effect of various enamels upon colouring oxides, his experience was chiefly in the pottery trade. When there was variation of the frits, it was found, say, in the case of lead frits, boric frits, barium frits, or magnesium glaze that the materials constituting those frits or glazes had a very decided effect on the colour which was produced. Colouring oxides containing iron or cobalt always tended to flux or soften the colours, giving browns and the darker blues. Green colours containing chrome certainly tended to be on the dark side; the darker the green, the harder the colour. Doubtless the enamellers had noticed that when they approached the olive green there was always a tendency to scum or to show a discoloration unless a much higher firing was given.

Time and temperature played a very important part in the production of various colours from different oxides. By allowing castings to remain a little longer in the kiln, they tended to take on a darker colour. Again, the effect of tin oxide was certainly a weakening one on the colour, similar to that shown in an example produced by the lecturer. The lighter colour contained more tin oxide than the darker one.

The lecturer had stated that it was difficult to obtain a grey. He had instanced that he obtained a variety of colour varying from browns and greens, etc., in greys. If the oxides were mixed together, and a flux was used to bring about a combination at a very much higher temperature than was going to be used to fuse in the enamel, did not the lecturer consider that the grey ought to be more permanent, and not show tendencies to green? A mixture of chrome, iron and cobalt rather suggested that the lecturer had got the three colours separating and showing out in the mixture. Was that a usual factor in his experimental work?

Grey Oxides

MR. BALL said that, if a prepared grey oxide was used in which the colouring matter had been actually combined with the stabiliser, the variation was consistently reduced. The variation in tint to which he had referred particularly was caused by a small percentage of black oxide, especially when used in a white frit. This gave the colour variation. Even though the black oxide was calcined at a high temperature, and the percentage was only small in the frit, it was extremely difficult to make a black oxide which would remain stable in the comparatively active enamel batch. If, as Mr. Foster had remarked, in the case of grey oxide, the various materials actually combined together with a flux, or preferably the reverse, a stabiliser of some description, then there would be a grey oxide which the enameller should use, and which would give him a perfectly satisfactory result without colour variation. The point he desired to emphasise was that, in order to get the grey without colour variation, a grey oxide must be used which had been stabilised at a high temperature.

MR. H. BRADLEY, referring to two examples exhibited, said that the lecturer had stated that (*a*) unsuitable oxide had been used in acid proof enamel, and (*b*) in ordinary enamel. Did the lecturer have any particular standard for a suitable one in grey? In his opinion, both examples would pass for a good enamel, the difference being only in colour. Was it a result of two separate firings, one being fired at, say, 780 deg. C. and the other at, say, 760 deg. C.? Firing, in itself, would cause a difference of colour. Why did the lecturer use the term "unsuitable oxide"?

Black and Grey Acid-Proof Enamels

MR. BALL said that perhaps the use of the term was unfortunate. The two examples showed the result by using the same oxide, which was a small percentage of black oxide, and which he had suggested was bad practice. It was quite a good black oxide in quite a good ordinary enamel, and the result, so far as colour was concerned, was satisfactory. The trials were based on actual experience. The enameller in question used the black oxide normally for his standard grey enamel. When he required an acid-proof enamel he put the same addition of the same oxide in acid-proof enamel. The good trials were actually fired on the same load at the same temperature of 750 deg. C. That was the point that he was trying to make. Although, in normal practice, the use of a black oxide seemed to be quite satisfactory, the first time the enameller varied his enamelling practice, namely, used a different enamel, it showed up the fault immediately. If he had used a prepared grey oxide, in the first place, there would not have been anything like the same difference when he used the different enamel, which was probably quite as good in the ordinary course of commercial enamelling.

Another two grey examples showed where the enameller had made rather a more fortunate choice with his grey oxide. It would not show up in his normal enamelling, but when he made the variation in his enamelling practice there was far less variation in oxide colour between the two enamels. The variation in colour was actually caused by the difference in combination between the two enamels. These were ground with the same mill addition and fired on the same production load. They were strictly comparative trials.

Red Enamels

While the two red examples were not strictly comparative, although the same oxide was used, they were two examples collected from different sources at different times. One example had a definite advantage because it was on a much lighter casting of even thickness. It had also another advantage, in that the enameller who used it put under it a thin coat of matt ground; this was not recommended, but it had definitely resulted in a better colour, because he had got the whitish coat underneath instead of the red being straight on the iron. In the other case there it was red on the top and all round the edges there was a difference in colour. The suggestion was made that the enameller should put the enamel back in the mill and grind it finer, and this proved successful.

In all enamelling, the red oxide stood out as an exception under normal practice; special methods had to be evolved in order to achieve successful results. By grinding the enamel to

the normal coarseness, and firing it with a normal load, one colour would be obtained, while by firing it in a special enamel, and in exactly the same way, there would be another result. It was a matter of keeping the enamel moving because the unfortunate colour variation developed just when the enamel was fusing. If the enamel remained in the semi-fused condition for too long, the heat of the furnace would have time to act on the actual oxide; whereas if the enameller got it past that semi-fusion as quickly as possible a brighter colour would result. This could be proved quite definitely by firing a casting with heavy lugs as would probably be done normally, namely, a shade slower. This would give it a longer firing than for an even casting. It would be found definitely that there were far worse results with the long, slow firing than with the quick firing, particularly if the casting just happened to hang at the unfortunate temperature. For those interested in reds or cadmium greens, that was a point they would have to control.

Pink Enamelled Baths

MR. F. MURRAY said that the lecturer had expressed the opinion that pink oxide was a very difficult colour, especially in connection with dusting baths. Probably this had been the experience generally. Could the lecturer give any intimation as to why there was a change of colour in a pink commonly known to be a difficult colour to enamel, and more particularly in the matter of match by any earthenware job? The point was illustrated by the pink tile example exhibited, which showed the same type of variation as was frequently seen in the case of a pink-enamelled bath. There was a certain whiteness. Could the lecturer state any reason for the change of tone in the surface?

MR. BALL said he wished that he could, and then possibly a cure might be found for the defect. There were two sources of obtaining a true pink, *i.e.*, a completely-combined pink oxide. There was a method that the pottery manufacturer adopted by using an extremely small percentage of chrome in a tin base, or there was the gold pink in which the pink was made up from a precipitated gold chloride. In neither of these cases, in the pottery industry, where greater latitude was allowed with regard to special glazes, etc., could entirely satisfactory results be obtained with the pink. The only other alternative which he could suggest, and which, no doubt, Mr. Murray had already tried, was to weaken down the red oxide. Initially, the red oxide caused trouble enough, and when it was weakened care should be taken not to run into the same trouble again. Pink appeared to be one of the colours which the colour manufacturer had not been able to make entirely stable in any branch of industry. The pottery trade had managed to produce a very nice pink, but could only do it in one particular way in the one particular glaze. Enamellers had not been able to adopt their practice and adapt it to suit certain definite enamelling conditions. He rather thought that the whiteness referred to was not altogether due to the fading of the colour; it might be some of the body showing through.

MR. MURRAY: Would finer grinding give a better effect?

MR. BALL replied that finer grinding was definitely beneficial, but it was only a mild sort of help. The original problem still remained. It was possible to have a pink oxide which was quite suitable for normal commercial enamel, but not for such pieces as baths where there was a tremendous variation in heat.

In further reply to Mr. Murray, the lecturer stated it was possible to prevent rust spotting either by the addition of rust salts or faster drying.

MR. MURRAY asked whether the lecturer recommended the use of rust salt in a green in the normal way.

MR. BALL said that if a green was wanted a suitable enamel should be used which had just received normal treatment, just in the same way as the grey.

Use of Fluorspar

MR. FOSTER said that a great deal of the variation in the pink colouring in the enamelling of pottery was due to conditions of firing. There was only a small percentage of chrome oxide in the tin compound and consequently the pink colour was not very stable. The addition of fluorspar to the glazes tended to bring the pink over to a stronger red and almost to a reddish brown. He did not know whether that had any particular bearing on the shade of pink produced, and whether it attacked the colour later. In regard to the cadmium reds the rate of firing and the temperature at which firing was done did not affect the colour. When put into the enamelling chamber they certainly varied with regard to the speed at which the enamel was fused. All these materials had to be fused by heat. The temperature should be one of continuous progress so that there was no falling back of the heat. The same remark applied to the fluid glazes so that they could get into close combination. The frit attacked the oxides, and occasionally tended to separate so much as to throw out parts of them, giving a sort of scum on their surface. Therefore, it was very important that the firing should be progressive in speed; the quicker it was done the better and the more brilliant the results obtained.

MR. BALL said that colour variation was much more troublesome with cast iron than with sheet iron.

Scum in Black Oxides

MR. H. BRADLEY asked why black oxides and black frit showed a tendency to scum in ordinary soft enamels upon coming in contact with dampness after leaving the vitreous enamelling rooms. The difficulty did not appear to be so great in the case of other colours.

MR. BALL replied that a start was made with a black frit in which the metallic oxides were in solution. Further metallic oxides were added to the black oxide with the result that there was a slightly greater tendency to produce a scum on the surface; particularly if there was the least possible doubt about the atmosphere of the furnace. There was not so much latitude. When the enamel was allowed to stand in a damp atmosphere the scum was accentuated, and if wiped off would recur. There was a tendency for the black to crystallise out on to the surface of the enamel.

MR. H. BRADLEY observed that he had not noticed the same effect in the case of acid-resisting enamels in the blacks.

MR. BALL thought that the atmosphere in the furnace had much to do with it.

Black Matt Finish

MR. B. B. KENT asked what was necessary in order to effect a matt finish in the case of black oxide.

MR. BALL said that various means were used. He was, personally, definitely of the opinion that if the matt finish was to be commercially satisfactory it must be produced in the enamel frit itself. The firm with which he was associated were actually making an enamel with the normal mill addition, 5 per cent. clay, and whatever oxide was used produced the vellum finish. It was a mixture of matt frit and 50 per cent. glassy frit. He could not say how other people produced the effect.

MR. KENT asked whether it was possible to produce the matt finish by taking an ordinary frit and adding, say, 20 per cent. of black oxide.

MR. BALL replied that it was. He did not think that the result depended particularly upon the oxide but more upon the frit. It was best to start off with a black frit, which, as Mr. Bradley had remarked, had a tendency to scum. An increase of oxide in the frit would definitely give a scummed finish. Whether the finish would be sufficiently reliable to be a sound commercial proposition he could not say.

Frits and Colours

MR. A. K. WILLIAMS said that the lecturer appeared to indicate that the use of different enamel frits had only a slight effect upon the percentage of oxide used. He had, personally, in many cases, used 5 per cent. of oxide in one frit and half as much of the same oxide in another frit, obtaining exactly the same colour. This appeared to show that the composition of the frit had far more effect on the variation in the firing of the oxide than was indicated in the Paper. He did not suggest that the lecturer had exaggerated the differences.

MR. BALL said that a different frit might produce a greater or lesser degree of opacity.

MR. WILLIAMS said that what he meant to imply was that in the mixing of the melt each of the constituents of which the frit was made had a definite bearing on the result obtained from the oxide.

MR. BALL, agreeing, said there were many people in charge of enamelling plants who appeared to be amazed when the same oxide did not give the same result in different enamels. When asking for a particular colour it was always advisable to state what type of frit was going to be used as well as to give some idea of the degree of opacity necessary.

Gas Troubles

MR. W. NOAKE mentioned an instance where an enamelled iron-sheet red colour had been successfully applied to an earthenware base and the result had been looked upon somewhat enviously by a pottery manufacturer who asked the question if it were possible to produce his tiles by similar methods. He could endorse Mr. Ball's remarks as regards the speed of firing and of degrees of temperatures. Further, that it was necessary to keep a strict control upon the conditions existing in the muffle when reds were being fired continuously for any prolonged period, due to the gases arising from the selenium and sulphur, also that damp atmospheric conditions were conducive to "filming" so far as certain colours were concerned. Special attention should be given to ensure the lining of the muffle being kept perfectly sound to minimise or eliminate this risk.

Load Factor

MR. H. BRADLEY, referring to speed of firing, assumed that what was meant was that the time of load in the furnace should be shorter. The more weight there was put in the furnace at one time the longer the time required to get the finished result. Would brighter reds be obtained by putting a very light load into the furnace?

MR. BALL: Quite definitely.

MR. MURRAY asked, with respect to the ordering of oxides by vitreous enamellers, would Mr. Ball suggest that they should definitely specify the frit they were going to use?

MR. BALL said he would not go to that extent by any means. In the normal run of enamelling it was quite in order to use any good make of oxide with any good make of frit. For special tones, and particularly matchings, some idea should be given of the kind of frit to be used. The suggestion had been made that there was a definite fume from the red enamel when fired. Even with ordinary enamel when fired, particularly in continuous furnaces, definite gases were evolved during the fusing of the plain frit. The suggestion put forward by Mr. Noake was that in the case of the red oxide there was an additional small percentage of gas evolved which gradually accumulated. The scum in the case of the black was not due to any form of sulphur from the enamel or oxide at all.

Mr. Ball said he did not suggest that the trouble was not due to sulphur; what he meant to imply was that there would be no increase of sulphur. Therefore, starting off with a leaky

surface, or just an ordinary furnace, the fact of putting five loads of black in would not alter the atmosphere.

Black and White Signs

MR. H. BRADLEY cited the case of a name plate done with white letters on a black background. As long as it was kept in a room heated in an ordinary manner, anything over 65 deg. Fah., it would remain definitely black and white. When it was hung upon a wall, and dampness struck it, or out in the street, the scum appeared which was washed off by the rain. In damp weather it was hardly possible to tell the white from the black at a distance because of the scumming on the black.

MR. BALL said that the example quoted was rather more extreme than in the case of ordinary "fretts." Most people who enamelled fretts sooner or later wanted to know why they got a bloom on their castings.

MR. MURRAY said it was usually sooner, and MR. BALL agreed.

Blue Banding

MR. FOSTER said that the remedy for a blue banding that was showing a scumming effect was to put a soft flux over the top of the black as it showed and reburn the article. The black scumming was due actually to the particular part of the glazed article being super-saturated with the colour oxide, which was cobalt in the particular case referred to. An increase of flux would tend to keep blacks brilliant and prevent blooming.

MR. BALL said he had seen the trouble remedied with fretts, particularly, by firing the load and taking it out of the furnace for two or three minutes, and then putting it back again for another two or three minutes.

The CHAIRMAN said that one of the simplest remedies for the prevention of blooming was to leave the furnace idle for a short time, and throw in a handful of lime to clear the atmosphere. There would not be any recurrence of the trouble for some time.

MR. NOAKE said that the pottery remedy was just a handful of plaster mould.

The CHAIRMAN replied that that would answer the same purpose.

On the motion of the CHAIRMAN, seconded by MR. MURRAY, a hearty vote of thanks was accorded to Mr. Ball for his extremely interesting Paper. The LECTURER briefly responded.

Acid Proof Enamelling of Cast Iron

The discussion which followed the reading of Mr. C. P. Stone's Paper on this subject, published in our issue of May 7, was opened by the CHAIRMAN (Mr. W. Todd), who said they had listened with great interest to an address which dealt in some detail with certain aspects of enamelling which were of the utmost importance if good results were to be secured. Mr. Todd mentioned that some queries had been received through the "Question Box," recently inaugurated. These queries asked for the following information:—(1) Why do acid proof slips frequently show a marked tendency to settle out; (2) Why do acid proof enamels frequently develop shore lines; (3) Can acid proof enamel be burned in a semi-muffle type of furnace without defects from sulphurous fumes?

Settling Out of Acid Proof Slips

MR. STONE, replying to the first point, said that a setting-up medium must be found, suitable for each type of acid proof enamel. Users would find that with some of the slips a set-up of the type of sodium aluminate would answer perfectly, whilst in other cases strong acids which act directly on the frit would be found necessary. Users compounding their own acid proof enamels, should be able, with a knowledge of their own compositions, to control the slip, and in the case of using frits supplied by a manufacturer, should act on their advice. For example, one might hear that Mr. Jones used carbonate of ammonia, whilst Mr. Smith did much better with acids. There was, however, a correct medium for every enamel, but it required finding, and the matter had been dealt with in the Paper.

Shore Lines

The second question of shore lines had been explained in the Paper by a gradual ebbing of the water, which in these days was usually associated with incorrect set-up of the enamel. Although special clays gave the best results in acid proof slips, it was also found necessary to use a set-up for the type of acid proof enamel used. The difficulty could be helped by keeping the water content as low as possible. In using acid proof enamels, it would be found that they work better in a thicker consistency than ordinary enamels. When shore-lining was violent, it often required correction of the frit itself.

Firing Acid Proof Enamels

The firing of acid proof enamels in semi-muffle type of furnaces would cause trouble with any enamel, unless the draft was so strong that it caused a partial vacuum in the vicinity of the work being fired, so that the fumes from the gas did not make contact with the ware. The use of a strong draft, however, was a very wasteful method of firing enamel ware. The fumes with the water vapour would cause sulphurous acid which settled on the ware and caused a great deal of trouble, not only in spoiling the surface, but often having the effect of boiling right through to the metal. Members were probably all aware how much scrap was caused by this defect, which was known as sulphuring.

Spraying Time

MR. BAYLISS asked whether the sprayer could estimate the difference in the amount of enamel required as between ordinary and acid resisting enamel. In other words, could more castings be sprayed, in less time, with an ordinary enamel?

MR. STONE, replying in the affirmative, said that acid proof enamel was set-up very strongly, and it was necessary to apply an apparently heavy coat, but which when dried, would be no thicker than an ordinary enamel. For instance, if a casting were coated in acid proof enamel about the same thickness as non-acid proof, when dried out and fired, the former would be burnt off in places. As to the speed of spraying, there was very little difference between the two enamels, but acid proof required a little more care, and therefore took a little longer.

Storage Properties of Acid Proof Enamels

MR. CARVER inquired as to the ageing of acid resisting enamel in slop form, and whether it was advisable to use it quickly after being milled, or would it keep as in the case of ordinary enamel?

MR. STONE said he had answered this point also, in the Paper. His own test was that acid resisting enamels should keep for weeks after preparation, and he personally had no use for an enamel which had to be adjusted daily. There was no reason why acid proof enamels should not be sent from the mill room set-up to the correct spraying strength, provided the enamels were suitable for the work in hand.

Property Maintenance

MR. CARVER asked whether the lecturer had any experience of an enamel which did not retain its acid proof property. Would he suggest that if it were a proper enamel it would keep indefinitely? (MR. STONE: Yes.) If one found that the enamel was not acid proof or acid resisting after a length of time, would firing conditions have any effect on its acid resisting qualities?

MR. STONE replied in the affirmative, and said that the enamel in such case would be very near the border line. If it had a good firing, it would have the effect of increasing the acid resisting properties of such an enamel, but it seemed to him from what the questioner said, that there was an excess of set-up in the enamel, probably due to doctoring it daily to keep it in suspension, with a set-up agent which was not suitable for the frit.

Pin-Holing in Enamels

MR. MORGAN thought that most of the trouble with castings for enamelling arose from badly prepared sand. The enamel might be perfectly good, but the cast iron might be unsuitable, or application of the enamel wrong. Much was said about dissolved gases, yet these dissolved gases did not come from the enamel, but from non-refractory sand. Regarding slag, this floated to the top, or to the back side of the casting, not to the enamel side.

He would suggest that the foundry department might co-operate with the enamelling shops, but he would also suggest that enamellers should bear in mind that their industry was no better off than that of the foundry when it came to the analysis of frits and similar matters. No doubt chemists could analyse everything, but actually the melting of the frit needed a great deal of care if they were to avoid trouble, and this was an aspect of enamelling of which they heard very little. He would like to inquire whether Mr. Stone in fusing the enamel on to the cast iron had noticed if it was free from pin-holes, and how he avoided them.

MR. STONE replied that there were very few enamels excepting, perhaps, those of a transparent nature, which were not liable to develop a few pin-holes, but it must be remembered that all enamels, after smelting, are run into water and broken up very finely by quenching. They are then finely ground for application to the plate or casting, so there was little possibility of gas remaining in the enamel.

With regard to the action of slag, they knew that slag always floated to the surface, but it also penetrated through to the face of the casting, which presented a problem which was dealt with in his opening remarks.

For comparison, in treating sheet metal, enamellers were not faced with the same difficulties as with cast iron. If sheets were delivered to any firm, showing dirt or slag inclusions, the metal would be sent back to the supplier who would accept it without quibble, as being defective. Mr. Stone emphasised that what was wrong in the one case, was wrong in the other; quite apart from the fact that in sheet metal they possessed a very dense metal on which to apply enamel.

The Cleanliness Factor

If the surface of cast iron could be chilled and made thoroughly dense, many troubles could be remedied. He had some knowledge of articles fitted with doors of acid proof enamel, in which chills were applied to the hinges. It was a remarkable thing that chilling helped to keep dirt away. In general, they found that it was essential to work on a clean metal in order to produce a good, clean job. A man who thought he could enamel cast iron satisfactorily, in which slag was present, would, he was afraid, have a bad time of it. He quite agreed as to the use of good refractory sands. All sands for enamelling purposes should be highly refractory. It is not perhaps common knowledge, but there were specially prepared sands in use which were much more refractory than ordinary moulding sands, and were only used on the face of the mould.

Facing Sand Mixture

No two plants obtained quite the same result. It had been found that sand composed of 60 per cent. Erith, medium 40 per cent. Parrish's fine

silica (which had been stove dried and sifted) and 7 per cent. coal dust, made a very satisfactory sand, but it had to be milled to a good bond for best results. It would be found that the surface would not be very smooth, but during enamelling excellent results had been obtained. Several plants are using this sand with modifications to suit their own practice.

MR. MORGAN mentioned that he had tried three types of refractory sands to a considerable extent. One was green sand specially mixed, another the ordinary facing sand, and the third a black sand, milled, which he considered to be the best.

MR. STONE said it might be enlightening if anyone could say what their experience had been with regard to sand, and castings for enamelling, because it meant a great deal in the efficient production of a satisfactory enamel finish.

MR. J. W. GARDOM spoke on the nature and behaviour of refractories, and their effect on castings. He also touched on the action of even and coarse grain sand in regard to heat expansion and release, and said that the foundry industry was progressive in obtaining the required material, and limiting scrap.

MR. STONE said he also wished to uphold the foundrymen a little, because, knowing that in the foundry there were many difficulties, he also appreciated that the foundrymen tried to overcome them. Further, enamellers should understand that during the last few years much progress had been made in this direction through research and experiments, coupled with practical experience. So far as sand was concerned, many companies had gone very carefully into the matter of testing.

Annealing Cast Iron

A member, inquired in regard to annealing, what the cooling rate was, and said he gathered the lecturer said it was about 830 deg. C.

MR. STONE replied that castings should be annealed at 800 to 830 deg. C., and cooled naturally.

MR. GARDOM remarked that much had been said about bubbling and chills, but the whole matter had nothing to do with composition. So also with lugs which would cool slower, whatever the rate of cooling of the casting might be. The graphite in the iron spread out into thicker flakes and caused a cavity, because the shrinkage was greater, and left a space between the graphite flakes and the iron. A slower rate of cooling caused an increase in the size of the cavity. It did not affect the position, whatever they did in annealing, for by heating they expanded the cavity, and when cooling set in, the cavity assumed its former size.

By keeping the graphite in as small a form as possible, they would find that the cavities would remain small also, and there was less chance of bubbling. It had been suggested that some of the costs of producing castings should not be taken into account, as provided satisfactory results were obtained from experiments, these costs would be recovered by ultimate sales. However, he thought it was not a good plan, especially for enamelling purposes, to produce castings merely at a price. The endeavour should rather be to ensure the castings were as perfect as possible; and he could assure them that the better class of foundries and foundrymen were endeavouring to do this. It was important to remember that if enamellers would pay a little more, they could be supplied with a close grained iron, with castings which contained only small forms of graphite. It might be necessary to add a little nickel to it, or something of that nature, but the results of this kind of study and care were well worth while. During the last ten years in his own company they had made 100 per cent. advance. He was not merely speaking of special irons, but of constant slight improvements in foundry technique, which were reflected in the quality of ordinary castings and production figures.

The metallurgist always had the idea of working up to an ideal. He might almost say that they had, in regard to shrinkages and blow-holes, arranged that when they did arise in castings, it should be in the most convenient part, so that they would not have to be unduly machined!

A vote of thanks to the lecturer concluded the meeting.

Stockport Foundry Company's Extensions

Extensive alterations now in progress at the Stockport premises of Henry Hollingdrake & Sons, Limited, at Victoria Buildings, Princes Street, will, when completed, provide two additional floors. Provision has been made for the erection of still further storeys if necessary at some future date, in addition to the present five floors. It is anticipated that the completed premises will be given a civic opening.

The activities of Hollingdrakes commenced in Stockport under the original title of Hollingdrake & Hickman, trading as ironfounders, with works situated in Great Underbank and Portwood, Stockport in 1814. At that time the firm specialised in the manufacture of plant for the production of gas, used in the early days of street lighting, and it is interesting to note that the original gas plants for the cities of St. Petersburg (now Leningrad) and Stockholm were manufactured by a firm which later was to become famous throughout five countries.

The partnership between Hollingdrake and Hickman was eventually dissolved, and the firm traded under the title of Henry Hollingdrake, jun., and the Portwood foundry was transferred to Underbank. The present mill and works-furnishing department had its origin as an ironmonger's shop situated in Priest Street, Hillgate, which business, in 1835, was transferred to 10, Market Place, Stockport. By the year 1863 there was a further change in the title of the company, when Mr. Robert Hollingdrake became a partner with his father. The firm continued to grow and in the same year the business in Market Place was moved to Great Underbank, under the title of Henry Hollingdrake & Son.

In conjunction with other local business gentlemen, Mr. Robert financed the construction of Victoria Buildings, the whole of which they occupy to-day. He also acquired a cotton mill, situated behind this property, and converted it to meet the requirements of a foundry. In 1882 both the works and business premises in Underbank were moved to their present positions, and an additional foundry in Stewart Street, Stockport, was purchased some years later.

With the ever-increasing demand for high-grade cast iron, a demand which was becoming more and more insistent with the passing of time, it was found necessary to re-model the foundry, and reconstruct and enlarge the millwrighting and machine shop. This work was undertaken in 1908 in pursuance of the firm's policy of striving after perfection and efficiency, and coincided with Mr. Robert Hollingdrake's two sons, Mr. Henry (afterwards Sir Henry) and Mr. Herbert becoming partners.

The company was formed into a limited liability company in 1911 when the present title was adopted, and facilities were thus provided for the satisfactory handling of its steadily increasing trade. The first motor-cars in the Stockport district were sold by the millwrighting and machine-shop department in 1901, and increasing sales and service in the motor industry resulted in the formation of the Hollingdrake Automobile Company, Limited, in 1905, whose imposing premises in Town Hall Square, Stockport, were constructed in 1922.

The addition of the range and sanitary fittings department was made in 1911, when the first alterations to Victoria Buildings were made under the direction of Sir Henry and Mr. Herbert Hollingdrake. The success of this department made the purchase of additional property essential. A four-storey building behind Victoria Buildings was bought in 1923 and converted into extensive showrooms for the fireplace and sanitary fittings department, and with the advent of wireless the company commenced a retail radio department in 1922, which in 1923 was converted into a wholesale business only, and occupied a portion of Atlas Buildings.

The company suffered two great losses in 1923 when both Sir Henry and Mr. Herbert Hollingdrake died suddenly. It is a tribute to their organising abilities and to the capable members of the firm who carried on the business, that the company still continued to advance. Progress was both consistent and regular, and stage by stage the company developed until to-day it holds a position of pre-eminence in the iron-foundry and ironmongery trades. The remaining portions of Victoria Buildings were taken over by the firm with a view to future extensions, so that when Mr. Robert Hollingdrake, the greatgrandson of the founder, joined the board in succession to his father in 1928, the shop fronts of Victoria Buildings were modernised, giving additional display space to the range and fireplace department, and at the same time a new despatch department and cellar stores were constructed.

Oxy-Acetylene Welding

TWELFTH INTERNATIONAL CONGRESS

The Twelfth International Congress of Acetylene, Oxy-Acetylene Welding and Allied Industries will be held in London from and including June 8 to 13. There will be an inaugural ceremony at the Guildhall on June 8, and in the evening a Government reception at the London Museum. On Tuesday evening the Congress Banquet will be held at Grosvenor House, Park Lane. In connection with the Congress there will be visits to various works, including those of the British Oxygen Company, Limited, at Cricklewood. In addition there will be exhibitions of films relating to oxy-acetylene welding.

The Congress itself will be held at Caxton Hall, Westminster, and among the Papers to be presented are the following:—"X-Ray Testing of Welds," by Dr. Ing. R. Berthold; "Radiography as Applied to Welding," by L. C. Percival and C. Coulson-Smith; "Contribution to the Study of Weldability of Steels," by J. Brillié and D. Séférian; "Study of the Formation of Metallic Nitrites in the Welding of Steels," by Prof. Portevin and D. Séférian; "Study of the Corrosion of Welds in Structural Steel," by J. Brillié, A. Leroy and A. Roux; "A Few Considerations for Further Research on Low-Temperature Steel Welding," by E. Lewis; "A New Principle for the Practical Teaching of Oxy-Acetylene Welders," by R. Granjon; "Results of Experiments in Oxy-Hydrogen Under-Water Cutting at Eildon Weir, Victoria, Australia," by J. B. Arnold; "Contribution to the Study of Deposits Obtained by Metal Spraying," by J. Fassbinder and P. Soulary.

Further particulars may be obtained on application to the General Secretariat, 639, Grand Buildings, Trafalgar Square, London, London, S.W.1.

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The Week's News in Brief

Trade Talk

A NEW 60-ton open-hearth furnace has been completed at the Lanarkshire Steelworks, Flemington, Motherwell.

H. D. BALLANTYNE & COMPANY, engineers and agents, of Glasgow, have removed to 261, West George Street. The new telephone number is Central 2923.

THE NOMINAL CAPITAL of the Special Steel Company, Limited, heat-treatment specialists, of Attercliffe, Sheffield, has been increased by £6,000 in £1 ordinary shares.

BULL'S METAL & MELLOID COMPANY, LIMITED, Yoker, Glasgow, have received a contract for the supply of eight propellers for destroyers which are being built in Sweden for the Swedish Royal Navy.

THE NEW £250,000 mill at the Albion Steel Works, owned by the Briton Ferry Steel Company, Limited, was officially started last week by Mrs. Bevan, wife of Major J. M. Bevan, chairman and managing director of the company.

MEMBERS of the Lancashire Branch of the Institute of British Foundrymen are to visit the foundries and works of the Ford Motor Company at Dagenham on Friday. The party will travel by train to St. Pancras, arriving at 11.25 a.m., and thence by motor-coach to the works.

HEAD, WRIGHTSON & COMPANY, LIMITED, Thornaby-on-Tees, have made an agreement with the Aetna Standard Engineering Company, of Youngstown, Ohio, to manufacture the latter company's steelworks plant, comprising sheet and tinplate equipment, seamless tube and pipe-mill equipment, and miscellaneous machinery.

REPRESENTATIVES of H. A. Brassert & Company, Limited, and of the Export Credits Guarantee Department of the Board of Trade, are at Angora to examine the possibility of concluding, with the Turkish Government, a contract for the installation of British plant for the Turkish iron and steel industry to be started at Karabuk.

THE POSSIBILITY of a new engineering works employing 200 to 300 men being established at Stockton was mentioned by the secretary, Mr. T. K. Briggs, at the recent meeting at Middlesbrough of the Tees District Development Board. He said he had received inquiries and had put the firm in touch with owners of a suitable site at Stockton.

AN EXTRAORDINARY MEETING of the General Electric Company, Limited, on June 25 will consider resolutions to cancel all special restrictions as to the transfer and issue of the British ordinary shares. The reasons for these restrictions have, in the directors' opinions, ceased to exist, and they consider that there is now no necessity of having two different classes of ordinary shares.

MEETINGS of the creditors and contributories of the Patent Axle Box & Foundry Company (1934), Limited, Wednesfield, Wolverhampton, were held in Birmingham on May 21. The statement of affairs showed gross liabilities of £849, of which £817 was expected to rank for dividend; net assets of £192, and a deficiency of £625. So far as the contributories were concerned the deficiency was £5,625. The matter was left in the hands of the Official Receiver.

AT THE GENERAL MEETING of the Union Steel Corporation of South Africa, Lieut.-Col. K. Rood, chairman, said the successful operations anticipated last year had materialised. Continued good business depended upon success in the mining industry, and there was no reason why they should not confidently look forward to continued prosperity. The Vaal works were now equipped with a machine shop, thereby avoiding the necessity in future of sending castings to other concerns for machining. This would add materially to foundry profits. An additional copper and wire drawing plant had also been installed, while the capacity of the rolling mill had been increased.

THE CHINESE GOVERNMENT PURCHASING COMMISSION has placed a contract with Glenfield & Kennedy, Limited, Kilmarnock, for the mechanical equipment of a control weir for the Huai River Commission, China. This contract follows an order received by Glenfield & Kennedy direct from the Huai River Commission last year, for a series of similar sluice gates. The present contract includes the supply, delivery and supervision of erection of 60 sets of free-roller sluice gates, each 10 metres span by 5.5 metres deep, equipped with independent operating gear and incorporating the firm's latest design of compensating roller paths on the gates. The gates are operated through winding drums and wire ropes, balancing being provided by reinforced-concrete counterweights. Normal operation of the gates is by hand, but two Diesel-engine auxiliary gear units, mounted on trucks, are being provided to increase the speed of operation if required.

Contracts Open

Aberdeen, June 15.—15,000-kw. turbo-alternator with condenser and auxiliary plant, for the Town Council. Mr. J. A. Bell, city electrical engineer, Millburn Street. (Fee £3 3s., returnable.)

Birmingham, June 11.—220 cast-iron sluice valves, for the Birmingham Tame and Rea District Drainage Board. Mr. H. C. Whitehead, engineer to the Board, Rookery Park, Erdington, Birmingham.

London, August 10.—Spun iron, cast-iron and steel spigot and socket pipes and cast-iron specials, for the Singapore Municipal Water Department. The Department of Overseas Trade. (Reference T.Y. 30,247.)

Thrapston, June 23.—24 miles of cast-iron water main from 5-in. to 3-in. dia., and 1,000 tons of cast-iron or spun-iron pipes from 5-in. to 3-in. dia., for the Oundle and Thrapston Rural District Council. Pick, Everard, Keay & Gimson, consulting engineers, 6, Millstone Lane, Leicester. (Fee £4 4s., returnable.)

Poole, June 13.—Electrically-driven centrifugal unchokeable type pumps, with motors in duplicate, for the Town Council. Mr. E. J. Goodacre, borough engineer. (Fee £1 1s., returnable.)

Southport, June 10.—Electrically-driven centrifugal pump, rotary air compressor and steam heater, for the Town Council. Mr. A. E. Jackson, borough engineer, Town Hall.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

Sattler Metals, Limited, 16, Langham Street, London, W.1.—Capital, £25,000. Directors: F. Sattler, A. Neubroch, H. Steinberg, A. Kohnke, and G. Durnford.

Bristol Metal Spraying & Welding Company, Limited, 15/17, St. Stephen's Street, Bristol.—Capital, £500 in £1 shares. Directors: W. H. Payne and Mrs. L. M. Payne.

Arthur Albutt & Company, Limited, 61a, Ladypool Road, Sparkbrook, Birmingham, 12.—Capital, £2,000 in £1 shares. Engineers, ironfounders, etc. Directors: F. A. Albutt and W. H. Millett.

Metamine (England), Limited, Lincoln House, High Holborn, London, W.C.1.—Capital, £1,000 in £1 shares. Galvanisers, rollers of metal sheets, etc. Directors: H. Shillitoe and G. R. T. Shillitoe.

Thomas Blackburn & Sons, Limited.—Nom. capital, £1,900. To take over the businesses of Thomas Blackburn & Sons, Limited, Russell Edwards & Company, Limited, and Stevensons, Limited, and to carry on the business of iron, steel, brass and bronze founders, etc. Subscriber: Y. Beaumont, 26a, The Grove, London, S.W.18.

Company Meeting

British Oxygen Company, Limited

At the meeting of the British Oxygen Company, Limited, held in London on May 26, DR. J. DONALD POLLOCK (chairman), said that 1935 could be characterised as another year of works' and plant extensions. The increase in sales had been assisted to a considerable degree by better general trading conditions during the last year throughout industry, and more especially by the improvement in the heavy industries. Several large and modern oxygen plants were brought into production during the year and considerable extensions were also completed to several of their works for the accommodation of such plants.

Personal

MR. ROBERT B. CHALMERS has been appointed to the position of manager with Douglas Fraser & Sons, Limited, ironfounders, of Arbroath.

MAJOR SIR RALPH GLYN, BT., M.P., has been elected to the board of J. Samuel White & Company, Limited, shipbuilders and engineers, of Cowes.

MR. JAMES M. SINCLAIR has been appointed a director of the Rose Street Foundry & Engineering Company, Limited, Inverness. Mr. Sinclair has for some years been acting London manager for the firm.

MR. JAMES SMITH, B.Sc., A.R.T.C., who has been for some time with the British Aluminium Company, Limited, at Kinlochleven, has been appointed metallurgist to the Ashanti Gold Mining Corporation, West Africa.

MR. HAROLD V. FIELD, head of the electrical engineering department of the Rutherford Technical College, Newcastle-upon-Tyne, has been appointed principal of the Constantine Technical College, Middlesbrough, in succession to the late Dr. T. J. Murray.

PROF. ALEXANDER LAWSON MELLANBY, D.Sc., who is retiring from the chair of Civil and Mechanical Engineering at the Royal Technical College under the age limit, and who is to deliver the second Edward Williams Lecture during the annual conference of the Institute of British Foundrymen next week, has been honoured by the University of Glasgow. The honorary degree of Doctor of Laws (LL.D.) will be conferred upon him on June 17.

MR. LEWIS CHAPMAN was re-elected President of the Crucible Steel Makers' Association at the annual meeting in Sheffield. Mr. C. K. Everitt (Edgar Allen & Company, Limited), Sir Ronald W. Matthews (Turton Bros. & Matthews, Limited) and Mr. Robert A. Neil (Jas. Neil & Company (Sheffield), Limited) were elected Vice-Presidents. Mr. T. Goddard Mander was re-elected secretary. A committee of management was also elected.

Obituary

MR. A. L. BROWN, a director and works manager of the Lion Foundry Company, Limited, Kirkintilloch, died suddenly on May 28 at the age of 49.

MR. WILLIAM LOW, for many years chairman of James F. Low & Company, Limited, textile machinery makers and ironfounders, of Monifieth, died last week, aged 75.

MR. W. H. SPRAGGS, who retired two years ago from the position of chief electrician with James Keith & Blackman Company, Limited, Arbroath, died on May 26 at the age of 67.

MR. JOHN DICKIE, of the Paisley Brass Works Company, Limited, Paisley, died on May 27. Mr. Dickie, who was in his 81st year, founded the firm many years ago and was regarded as one of the most progressive brass founders in Scotland. He retired from active work about a year ago on account of ill health.

SIR ARCHIBALD DENNY, BT., the well-known Clyde shipbuilder, died in London on May 29. Sir Archibald was born at Dumbarton in 1860, and served his apprenticeship with William Denny & Bros., Limited, becoming a partner of the firm in 1883. He took an active part in the work of the shipyard. At various periods of his career he was President of the Institute of Marine Engineers, the Institution of Engineers and Shipbuilders in Scotland, and of the Institution of Junior Engineers. He was also a Vice-President of the Institution of Naval Architects and Honorary President of the British Corporation for the Registration of Shipping. In 1911 the University of Glasgow conferred on him the honorary degree of LL.D. He was created a baronet in 1913.

Forthcoming Events

JUNE 8-13.

Twelfth International Congress of Acetylene, Oxy-Acetylene Welding and Allied Industries:—To be held in London, at Caxton Hall, Westminster.

Institute of British Foundrymen

JUNE 9-12.

Annual Conference in Scotland.

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Raw Material Markets

Steelmakers have at last been compelled to advance prices of heavy steel products. The increases had long been expected, owing to the rising costs of production. Export quotations remain unchanged. Prices of heavy steel have remained remarkably stable in recent years, the last rise being in 1929. Prices of semi-finished steel and of steel-making pig-irons are also higher.

Pig-Iron

MIDDLESBROUGH.—Slight relief has been given to the Cleveland pig-iron market by the recent increase in the output of foundry iron, but tight conditions must inevitably prevail for a considerable period. Arrears in deliveries have to be cleared before new business can be accepted. Makers have their outputs accounted for at least to the end of June, when the current Association prices will be raised by 5s. per ton. Present values for No. 3 Cleveland G.M.B. are 70s. per ton in the Middlesbrough and Falkirk areas, 72s. on the North-East Coast, and 73s. on Clydeside, but these figures are, of course, only nominal.

The demand for supplies of East Coast hematite remains on a heavy scale, and many producers are fully sold to the end of the year. Deliveries, in many cases, are behind schedule. As a result of the heavy home demand little interest can be taken in the export market. Quotations have been advanced by 3s. 6d. per ton, and the official values are now based on No. 1 East Coast quality at 80s. 6d. in Scotland, on the North-East Coast, or Tees-side. Prices for delivery in other areas have been correspondingly raised.

LANCASHIRE.—New business in this area has been only on a moderate scale during the past week. However, several foundries have bought well into the second half of the year. Deliveries are satisfactory, the aggregate for May being in excess of the previous month's total. The light-castings founders are well employed and are taking up large tonnages of pig-iron, while machine-tool makers, jobbing founders, and several of the general and specialised engineering firms also have good order-books. Offers of Staffordshire, Derbyshire and Lancashire brands of No. 3 foundry iron for delivery to users in the Lancashire zone during the second half of the year are on the basis of 83s. per ton, with Northants at 81s. 6d. Producers of hematite require two or three weeks for delivery in this area. Quotations are now at 89s. per ton for West Coast material and 88s. to 88s. 6d. for East Coast iron, both delivered equal to Manchester. Scottish foundry iron is offered around 89s. per ton.

MIDLANDS.—Holidays were curtailed in all sections of the iron and steel trades in this area. Local ironfoundries have heavy requirements of pig-iron, and arrears in deliveries from the furnaces are becoming more pronounced. The Association minimum prices, which will be increased by 5s. per ton at the end of June, are 75s. for Derbyshire, Lincolnshire and North Staffordshire No. 3, and 72s. 6d. for Northants No. 3, less a small sliding-scale rebate to large users and including delivery to Birmingham and Black Country stations. Deliveries of forge pig-iron are behind schedule, while prices are maintained at 5s. below foundry No. 3 for puddling purposes, or 3s. less if required by foundries. The call for the special grades of iron is on a good scale. Prices are not controlled and vary considerably. Low-phosphorus iron is quoted at 92s. 6d. to 100s., including Scottish at 95s., and medium-phosphorus at 80s. to 87s. 6d., while refined pig-iron varies between £6 10s. and £7 15s., delivered in the South Staffs area. Deliveries of hematite are behind schedule. Values have been increased by 3s. 6d. per ton, and the new minimum rates are £4 12s. for West Coast mixed numbers, £4 11s. for East Coast No. 3, and £4 10s. 6d. for Welsh mixed numbers, including delivery in this area. If delivery into works is required 1s. 6d. extra is charged.

SCOTLAND.—Active conditions continue to prevail on the Scottish pig-iron market, and deliveries are being well taken up. The official price remains at 79s. f.o.t. furnaces for No. 3 foundry, with 2s. 6d. extra for No. 1. Supplies of Cleveland iron are still far below local founders' requirements, and business is handicapped in consequence. No. 3 Cleveland iron is unchanged at 70s. at Falkirk and 73s. at Glasgow, but these figures are only nominal, no material being available. Official quotations for steelmaking irons, which are well inquired for, have been advanced and are now 80s. 6d. for mixed numbers of East Coast, West Coast and Scottish hematite at steelworks, with basic, British and Indian, at 75s. (less 5s. rebate), delivered.

Coke

Firm conditions continue to prevail in the foundry-coke market. It is difficult to obtain supplies from the ovens, and makers are reluctant to increase their commitments. For delivery in Birmingham and district best Durham coke is quoted at 41s. 6d. to 43s., and Welsh coke from 39s. to 50s.

Steel

Production of steel continues to be on a high level and deliveries into consumption are on a heavy scale. It is increasingly difficult to secure early delivery of most descriptions of steel materials and five or six weeks' delay is not abnormal. In the semi-finished steel section the full output is being taken up immediately following production and deliveries are in arrears. This department has been relieved somewhat by the heavy imports from the Continent, but supplies, even so, remain scarce. Export business in the finished-steel market has further improved, while home activity has been maintained on a satisfactory level. Steelworks engaged on the manufacture of heavy material remain well employed and their plants are operating at capacity. During the past week steelmakers have advanced home trade quotations for ship, boiler and chequer plates by 12s. 6d. per ton and prices for medium plates by 10s. The angle basis price is now £9, while ship plates have been raised to £9 7s. 6d. In the semi-finished steel department the price of soft, untested billets has been increased by 5s. to £6 2s. 6d. for 100-ton lots. Small steel bars have become 6s. per ton higher.

Scrap

The demand for heavy steel scrap on the Cleveland market has been maintained, and the price is still 57s. 6d. per ton, although 60s. has been paid where transport costs are high. Machinery cast-iron scrap is still at 65s. and is very firm. An active demand exists for heavy foundry cast iron at 62s. 6d. The Midlands market continues to witness active trading conditions, and most qualities are well taken up. Mixed heavy iron and steel is at 52s. 6d., while heavy machinery metal, broken into cupola sizes, is at 70s., good, heavy, pipe and plate scrap at 65s., and clean light at 52s. 6d. to 55s. Short, heavy steel, suitable for foundry purposes, is difficult to procure at 70s. per ton delivered works. Prices of scrap are unchanged on the Scottish market. Heavy, mild-steel, melting scrap is at 57s. 6d. per ton, with heavy basic, or heavy iron and steel scrap mixed, at 5s. per ton less. Heavy machinery cast-iron scrap is around 70s., while ordinary cast iron, for foundry work, and in pieces not exceeding 1 cwt., is about 67s. per ton, delivered f.o.t. consumers' works.

Metals

Copper.—Renewal of business following the Whitsun holiday has been slow, and the market presents a dull appearance. Only a few hundred tons are being sold daily in the United States market, which remains colourless. According to unofficial statistics, world copper stocks declined in April by 12,050 short tons, to 471,100 short tons. Consumption was slightly higher in April, while production declined by nearly 9,000 short tons.

Daily market prices :—

Cash.—Thursday, £36 10s. to £36 11s. 3d.; Friday, £36 11s. 3d. to £36 13s. 9d.; Tuesday, £36 10s. to £36 11s. 3d.; Wednesday, £36 5s. to £36 6s. 3d.

Three Months.—Thursday, £36 15s. to £36 16s. 3d.; Friday, £36 16s. 3d. to £36 18s. 9d.; Tuesday, £36 15s. to £36 17s. 6d.; Wednesday, £36 11s. 3d. to £36 12s. 6d.

Tin.—Only a moderate demand has been received from the consuming industries in this country. The tinplate mills have called for considerably less tin during the past week than for some time. The price on Wednesday declined to the lowest level since May, 1933.

Buying interest on the Continent has been quiet, while consumption in the United States is reported to be on a good scale, although current business does not amount to any substantial tonnage. Consumption of tin was at a high level in March, the total being 13,424 tons, the highest reached since September, 1935. According to statistics given in the May issue of the International Tin Research and Development Council's Bulletin, published by the Hague Statistical Office, world apparent consumption of tin in the year ended March 31, 1936, was 147,877 tons, representing an increase of 25,529 tons, compared with the previous 12 months. World production in the year to March, 1936, was 145,164 tons.

Metal Exchange quotations were as follow :—

Cash.—Thursday, £198 5s. to £198 10s.; Friday, £195 12s. 6d. to £195 15s.; Tuesday, £192 to £192 5s.; Wednesday, £187 to £187 10s.

Three Months.—Thursday, £193 17s. 6d. to £194; Friday, £191 10s. to £192; Tuesday, £189 to £189 5s.; Wednesday, £185 to £185 10s.

Spelter.—Little change has occurred in the general condition of this market, which remains featureless. Industrial demand is, if anything, rather less than the pre-holiday level. Despite rumours to the contrary, the market price in the United States remains unchanged at 4.90 cents. per lb. East St. Louis. Business is dull. World production of slab zinc during April, as reported by the American Bureau of Metal Statistics, was 131,000 tons, against 132,500 tons in March.

Official quotations were as follow :—

Ordinary.—Thursday, £14 7s. 6d.; Friday, £14 5s.; Tuesday, £14 3s. 9d.; Wednesday, £14 2s. 6d.

Lead.—Consumption is reported to be maintained on a satisfactory scale in this country, although current business is only moderate. The Continent is taking up large quantities of lead, while rather more buying interest has recently been shown by United States consumers. The American Bureau of Metal Statistics reports that world production of lead during April was 140,400 tons, compared with 128,700 tons in March. The April output was the largest since December, 1935.

Day-to-day quotations :—

Soft Foreign (Prompt).—Thursday, £15 8s. 9d.; Friday, £15 11s. 3d.; Tuesday, £15 7s. 6d.; Wednesday, £15 3s. 9d.

Company Reports

Ransomes, Sims & Jefferies, Limited.—Dividend on the 5½ per cent. preference shares for the 2½ years to December, 1935.

Stanton Ironworks Company, Limited.—Final ordinary dividend of 6 per cent., making 10 per cent. for the year ended March 31.

Crompton Parkinson, Limited.—Interim dividend of 6 per cent. actual on the ordinary and "A" ordinary shares in respect of the year ending September 30, 1936.

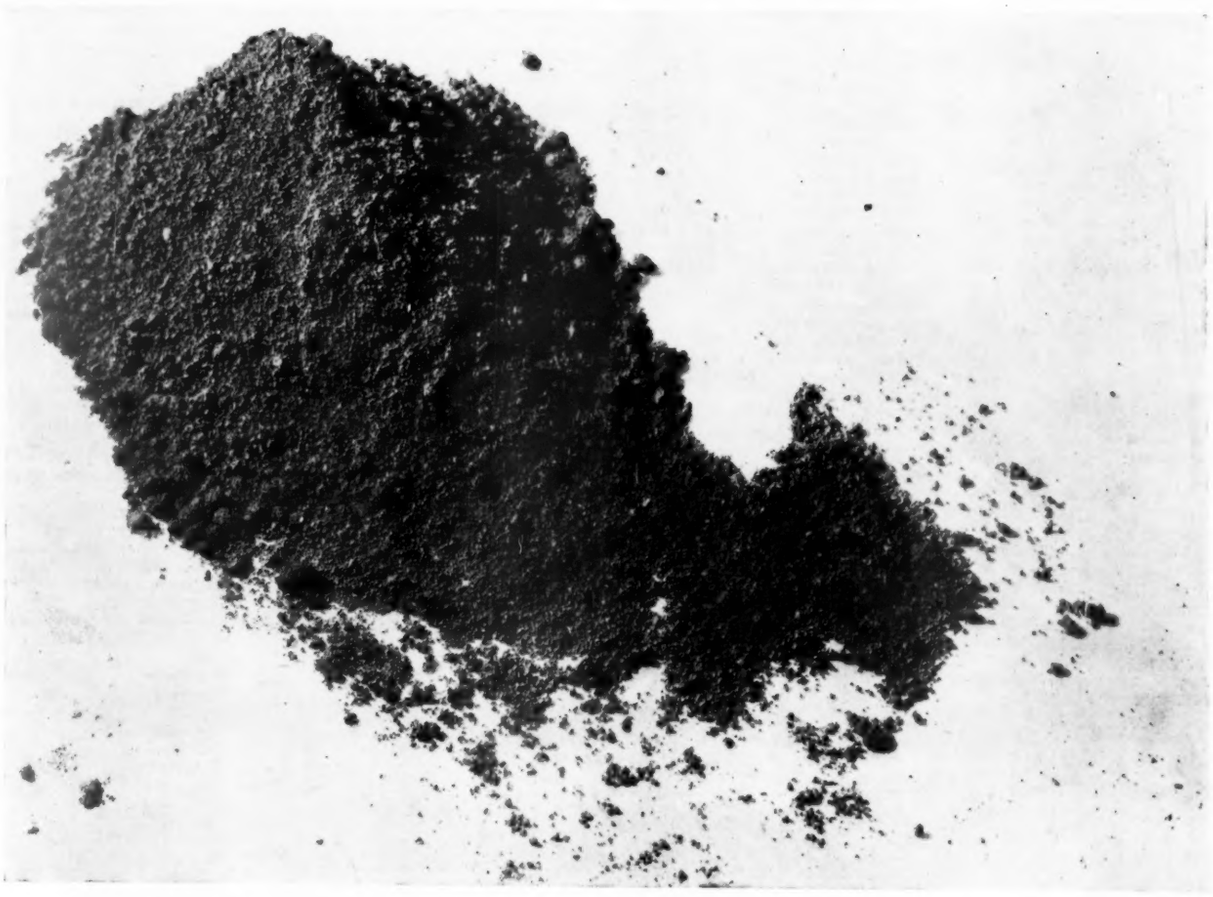
Stewarts and Lloyds of South Africa, Limited.—Final dividend at the rate of 6 per cent. per annum on the first cumulative preference shares for the half-year to June 30.

Anderston Foundry Company, Limited.—Net profit, £1,423; brought in, £938; from reserve, £2,000; dividend of 4 per cent. out of profits and, in addition, a distribution of 2s. 6d. a share out of the balance standing at the credit of the investment reserve.

Ruston & Hornsby, Limited.—Balance on trading account, after depreciation, losses on exchange, and other contingencies, and including dividends receivable from subsidiary companies, £109,369; dividend from the associated company, Ruston-Bucyrus, Limited, £24,400; available, after directors' fees and debenture stock interest, and adding £59,765 brought in, £169,594; dividend of 5 per cent. on the ordinary stock; to general reserve account, £25,000; carried forward, £59,594.

Glenfield & Kennedy, Limited.—Profit, £84,443; brought in, £61,782; dividend of 4½ per cent. on the "A" preference shares free of tax, £4,500; dividend of 7½ per cent. on the "B" preference shares less tax, £5,766; interim dividend of 4 per cent. on the ordinary shares less tax, £10,075; to staff pension fund, £4,548; to reserve, £40,000; final dividend of 6 per cent. on the ordinary share capital, making 10 per cent. for the year, £14,869; carried forward, £66,467.

TOR ROCK SAND



It is now possible to obtain from a deposit in the Midlands, a moulding sand possessing all the excellent characteristics of the Scottish Rock sands. This sand we have called Tor Rock Sand. It is well bonded, coarse in grain, and highly permeable.

The advantage this sand offers to iron founders in the Midlands and the South is obvious. Railway rates, which represent a high proportion of the cost of moulding sand when delivered are reduced considerably. Please write for full particulars and samples.

CHEMICAL ANALYSIS

Silica	86·8 %
Ferric Oxide	1·43%
Alumina	7·6 %
Lime	·22%
Magnesia	·18%
Titanic Oxide	·18%
Alkalies	1·8 %
Loss on ignition	1·6 %

MECHANICAL ANALYSIS

Very Coarse Sand (+ 1 mm)	16·5%
Coarse Sand (+·5 mm—1 mm)	16·0%
Medium Sand (+·25 mm—·5 mm)	11·0%
Fine Sand (+ ·1 mm—·25 mm)	30·0%
Silt Grade (+ ·01 mm—·1 mm)	7·0%
Clay Grade (—·01 mm)	19·5%

GENERAL REFRACTORIES Ltd.,

Genefax House, Sheffield.

Telephone: Sheffield 31113 (6 lines).

Telegrams: "Genefa , Sheffield."

London Office:
Russell House,
Adelphi, W.C.2.
Telephone: Temple Bar 7361.
Telegrams:
"Genefax, Rand-London."

Scottish Office:
156, St. Vincent St.,
Glasgow.
Telephone: 5250.
Telegrams:
"Genefax, Glasgow."

South Wales Office:
11, Wind St.,
Swansea.
Telephone: 3580.
Telegrams:
"Genefax, Swansea."

MANUFACTURERS OF HEAT RESISTING AND HEAT INSULATING MATERIALS OF EVERY DESCRIPTION

RAW MATERIALS—PRICE LIST

(Wednesday, June 3, 1936)

COPPER

	£ s. d.
Standard cash	36 5 0
Three months	36 11 3
Electrolytic	40 5 0
Tough	39 0 0
Best selected	39 10 0
Sheets	68 0 0
India	49 15 0
Wire bars	40 17 6
Ingot bars	40 17 6
H.C. wire rods	44 7 6
Off. av. cash, May	36 14 6⅜
Do., 3 mths., May	37 0 2⅞
Do., Sttlmnt., May	36 14 6⅜
Do., Electro, May	41 0 8½
Do., B.S., May	40 9 2
Do., wire bars, May	41 4 7½
Solid drawn tubes	10½d.
Brazed tubes	10½d.
Wire	6¼d.

BRASS

Solid drawn tubes	9½d.
Brazed tubes	11½d.
Rods, drawn	8¾d.
Rods, extd. or rlld.	5d.
Sheets to 10 w.g.	8d.
Wire	7½d.
Rolled metal	7½d.
Yellow metal rods	5d.
Do. 4 × 4 Squares	5½d.
Do. 4 × 3 Sheets	5¾d.

TIN

	£ s. d.
Standard cash	187 0 0
Three months	185 0 0
English	187 0 0
Bars	188 0 0
Straits	189 0 0
Australian (nom.)	—
Eastern	190 10 0
Banca	188 10 0
Off. av. cash, May	202 12 1½
Do., 3 mths., May	197 4 4½
Do., Sttlmt., May	202 12 4½

SPELTER

	£ s. d.
Ordinary	14 2 6
Remelted	13 15 0
Hard	11 0 0
Electro 99.9	16 7 6
English	14 7 6
India	12 10 0
Zinc dust	19 10 0
Zinc ashes	4 5 0
Off. aver., May	14 13 1½
Aver. spot, May	14 10 8½

LEAD

	£ s. d.
Soft foreign ppt.	15 3 9
Empire (nom.)	16 2 6
English	17 5 0
Off. average, May	15 11 3½
Average spot, May	15 10 7½

ALUMINIUM

Ingots	£100 to £105
Wire	1/3 to 1/4 lb.
Sheet and foil	1/2 to 1/4 lb.

ZINC SHEETS, &c.

Zinc sheets, English	24 10 0 to 25 0 0
Do., V.M. ex-whse.	24 10 0 to 25 0 0
Rods	26 10 0

ANTIMONY

English	66 10 0 to 67 10 0
Chinese, ex-whse.	55 0 0
Crude, c.i.f.	27 0 0

QUICKSILVER

Quicksilver	11 15 0 to 12 5 0

FERRO-ALLOYS AND STEEL-MAKING METALS

Ferro-silicon—	
25%	8 17 6
45/50%	12 15 0
75%	17 17 6
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free	4/6 lb. Mo.
Ferro-titanium—	
20/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£21 0 0 to £22 0 0
Ferro-tungsten—	
80/85%	3/- lb.
Tungsten metal powder—	
98/99%	3/3 lb.
Ferro-chrome—	
2/4% car.	33 0 0
4/6% car.	21 10 0
6/8% car.	21 0 0
8/10% car.	21 0 0
Ferro-chrome—	
Max. 2% car.	33 10 0
Max. 1% car.	36 5 0
Max. 0.70% car.	37 5 0
70% carbon-free	9½d. lb.
Nickel—99.5/100%	£200 to £205
"F" nickel shot	£184 0 0
Ferro-cobalt, 98/99%	6/3 to 6/9 lb.
Metallic chromium—	
96/98%	2/5 lb.
Ferro-manganese (net)—	
76/80% loose	£11 5 0 to 11 15 0
76/80% packed	£12 5 0 to 12 15 0
76/80% export	(nom.) £10 5 0
Metallic manganese—	
94/96% carbon-free	1/3 lb.

Per ton unless otherwise stated, basis 2-ton lots.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 1/16 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

	£ s. d.	£ s. d.
South Wales—		
Heavy steel		3 5 0
Mixed iron and steel	3 0 0	to 3 1 6
Heavy cast iron	2 17 6	to 3 0 0
Good machinery	3 2 6	to 3 5 0
Cleveland—		
Heavy steel		2 17 6
Steel turnings		2 0 0
Heavy cast iron		3 2 6
Heavy machinery		3 5 0
Midlands—		
Light cast-iron scrap	2 12 6	to 2 15 0
Heavy wrought iron	3 7 6	to 3 10 0
Steel turnings		2 2 6
Scotland—		
Heavy steel		2 17 6
Ordinary cast iron		3 7 0
Engineers' turnings		2 2 6
Cast-iron borings		1 17 6
Wrot-iron piling		3 10 0
Heavy machinery	3 9 0	to 3 10 0

London—Merchants' buying prices, delivered yard.

Copper (clean)	29 0 0
Brass	19 0 0
Lead (less usual draft)	13 10 0
Tea lead	10 0 0
Zinc	9 0 0
New aluminium cuttings	74 0 0
Braziery copper	26 0 0
Gunmetal	27 0 0
Hollow pewter	150 0 0
Shaped black pewter	105 0 0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	72/6
,, No. 3	70/-
,, No. 4	69/-
Forge No. 4	69/-
Hematite No. 1	80/6
Hematite M/Nos.	80/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	80/6
,, d/d Birm.	92/-
Malleable iron d/d Birm.	120/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	72/-
,, No. 3 fdry.	75/-
Northants forge	69/6
,, fdry. No. 3	72/6
,, fdry. No. 1	75/6
Derbyshire forge	72/-
,, fdry. No. 3	75/-
,, fdry No. 1	78/-
Scotland—	
Foundry, No. 1, f.o.t.	81/6
,, No. 3, f.o.t.	79/-
Cleveland No. 3, Glasgow	73/-
,, ,, Falkirk	70/-
Scottish hem. M/Nos. d/d	80/6
Sheffield (d/d district)—	
Derby forge	69/6
,, fdry. No. 3	72/6
Lincs forge	69/6
,, fdry. No. 3	72/6
W.C. hematite	93/6
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	78/-
Staffs fdry. No. 3	78/-
Northants fdry. No. 3	76/6
Cleveland fdry. No. 3	78/-
Dalzell, No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	89/-
Clyde, No. 3	89/-
Monkland, No. 3	89/-
Summerlee, No. 3	89/-
Eglinton, No. 3	89/-
Gartsherrie, No. 3	89/-
Shotts, No. 3	89/-

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£ s. d.	£ s. d.
Bars (cr.)		10 2 6
Nut and bolt iron	8 10 0	to 9 0 0
Hoops	11 0 0	and up.
Marked bars (Staffs) f.o.t.		12 10 0
Gas strip	11 0 0	and up.
Bolts and nuts, ¾ in. × 4 in.	15 15 0	and up.
Steel—		
Plates, ship, etc.	9 7 6	to 9 10 0
Boiler plts.	9 17 6	to 10 0 0
Chequer plts.		11 0 0
Angles		9 0 0
Tees		10 0 0
Joists		9 7 6
Rounds and squares, 3 in. to 5½ in.		10 0 0
Rounds under 3 in. to ⅜ in. (Untested)		9 7 0
Flats—8 in. wide and over		9 5 0
,, under 8 in. and over 5 in.		9 10 0
Rails, heavy	8 5 0	to 8 10 0
Fishplates		12 10 0
Hoops (Staffs)		10 2 0
Black sheets, 24g. (4-t. lots)		11 10 0
Galv. cor. shts. (,,)		13 10 0
Galv. flat shts. (,,)		14 0 0
Galv. fencing wire, 8g. plain		15 0 0
Billets, soft	6 2 6	and up.
Billets, hard	7 2 6	to 7 7 6
Sheet bars	5 15 0	to 6 5 0
Tin bars	5 15 0	to 6 5 0

PHOSPHOR BRONZE

	Per lb. basis
Strip	10½d.
Sheet to 10 w.g.	11½d.
Wire	12½d.
Rods	11½d.
Tubes	14d.
Castings	12½d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in. wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	21.31
No. 2 foundry, Valley	19.50
No. 2 foundry, Birm.	15.50
Basic, Valley	19.00
Malleable, Valley	19.50
Grey forge, Valley	19.00
Ferro-mang. 80%, seaboard	75.00
O.-h. rails, h'y, at mill	36.37½
Billets	28.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.80
Steel bars	1.85
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.80
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.10
Plain wire	2.40
Barbed wire, galv.	2.60
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/- to 32/6
,, furnace	20/- to 25/-
Durham foundry	25/- to 26/-
,, furnace	22/6
Scotland, foundry	30/-
,, furnace	25/- to 26/-

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	18/9
,,	28×20 ,,	37/6
,,	20×10 ,,	27/-
,,	18¾×14 ,,	19/6
C.W.	20×14 ,,	15/9 to 16/3
,,	28×20 ,,	34/3
,,	20×10 ,,	23/-
,,	18¾×14 ,,	15/9 to 16/3

SWEDISH CHARCOAL IRON & STEEL

Pig-iron	£6 0 0 to £7 0 0
Bars-hammered, basis	£16 0 0 to £16 10 0
Bars and nail-rods, rolled, basis	£15 15 0 to £16 0 0
Blooms	£10 0 0 to £12 0 0
Keg steel	£30 0 0 to £31 0 0
Faggot steel	£18 0 0 to £23 0 0
Bars and rods dead soft, st'l	£10 0 0 to £12 0 0

All per English ton, f.o.b. Gothenburg.
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

	£	s.	d.		
May 28 ..	36	10	0	dec.	2/6
„ 29 ..	36	11	3	inc.	1/3
June 2 ..	36	10	0	dec.	1/3
„ 3 ..	36	5	0	„	5/-

Electrolytic Copper

	£	s.	d.		
May 28 ..	40	10	0	dec.	5/-
„ 29 ..	40	10	0	No	change
June 2 ..	40	10	0	„	„
„ 3 ..	40	5	0	dec.	5/-

Standard Tin (cash)

	£	s.	d.		
May 28 ..	198	5	0	dec.	35/-
„ 29 ..	195	12	6	„	52/6
June 2 ..	192	0	0	„	72/6
„ 3 ..	187	0	0	„	100/-

Tin (English ingots)

	£	s.	d.		
May 28 ..	198	5	0	dec.	40/-
„ 29 ..	195	15	0	„	50/-
June 2 ..	192	0	0	„	75/-
„ 3 ..	187	0	0	„	100/-

Spelter (ordinary)

	£	s.	d.		
May 28 ..	14	7	6	inc.	7/6
„ 29 ..	14	5	0	dec.	2/6
June 2 ..	14	3	9	„	1/3
„ 3 ..	14	2	6	„	1/3

Spelter (Electro, 99.9 per cent.)

	£	s.	d.		
May 28 ..	16	10	0	dec.	1/3
„ 29 ..	16	7	6	„	2/6
June 2 ..	16	7	6	No	change
„ 3 ..	16	7	6	„	„

Lead (soft foreign, prompt)

	£	s.	d.		
May 28 ..	15	8	9	dec.	2/6
„ 29 ..	15	11	3	inc.	2/6
June 2 ..	15	7	6	dec.	3/9
„ 3 ..	15	9	0	„	3/9

Lead (English)

	£	s.	d.		
May 28 ..	17	10	0	No	change
„ 29 ..	17	10	0	„	„
June 2 ..	17	10	0	„	„
„ 3 ..	17	5	0	dec.	5/-

A COMPARISON OF SCRAP PRICES

Average Monthly Prices of Cast-Iron Scrap in the Principal Districts in the Years 1930–36

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
SCOTLAND (Heavy Machinery)—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1930..	3 10 0	3 9 6	3 8 6	3 8 3	3 8 1	3 5 9	3 3 2	3 3 4	3 3 0	3 0 9	2 19 4	2 17 8	3 4 9
1931..	2 15 0	2 15 0	2 13 3	2 10 8	2 9 9	2 8 3	2 8 6	2 7 9	2 5 6	2 9 8	2 14 5	2 15 9	2 11 2
1932..	2 15 0	2 15 0	2 12 6	2 10 6	2 7 6	2 5 3	2 4 5	2 3 10	2 4 10	2 4 4	2 4 0	2 4 8	2 7 8
1933..	2 7 0	2 9 3	2 10 8	2 10 5	2 9 5	2 9 3	2 8 6	2 10 9	2 10 4	2 10 7	2 10 10	2 12 4	2 9 11
1934..	2 14 2	2 17 9	2 18 5	2 18 3	2 15 5	2 15 9	2 14 3	2 15 0	2 15 9	2 15 0	2 15 8	2 16 3	2 16 0
1935..	2 15 5	2 15 8	2 15 10	2 16 4	2 16 10	2 17 0	2 16 9	2 16 9	2 17 0	2 16 11	2 19 11	3 2 7	2 17 5
1936..	3 4 8	3 9 10	3 10 11	3 11 10	3 10 8	—	—	—	—	—	—	—	—
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
N.E. COAST (Heavy Qualities)—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1930..	3 4 6	3 4 1	3 3 3	3 2 6	3 0 5	2 19 5	2 17 9	2 16 3	2 16 3	2 13 4	2 6 6	2 11 9	2 18 6
1931	2 10 4	3 9 8	2 9 7	2 8 3	2 6 3	2 3 8	2 2 9	2 1 9	2 1 0	2 2 1	2 9 9	2 6 6	2 5 11
1932..	2 6 3	2 5 8	2 3 0	2 0 8	1 19 0	2 1 0	1 15 9	1 15 6	1 15 6	1 15 6	1 17 4	1 19 10	1 19 7
1933..	2 1 1	2 2 2	2 4 9	2 3 5	1 18 9	1 19 6	2 0 0	2 0 0	2 1 3	2 5 8	2 7 10	2 10 1	2 5 4
1934..	2 12 7	2 15 1	2 13 7	2 11 6	2 11 11	2 13 9	2 11 0	2 10 6	2 11 3	2 11 10	2 13 9	2 13 3	2 12 4
1935..	2 12 2	2 13 0	2 12 7	2 13 0	2 12 9	2 12 6	2 12 6	2 12 6	2 12 6	2 12 6	2 12 6	2 16 10	2 12 10
1936..	3 0 0	3 1 10	3 1 8	3 2 2	3 4 6	—	—	—	—	—	—	—	—
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
S. WALES (Heavy Cast Iron)—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1930..	3 18 5	3 18 9	2 19 0	2 18 8	2 17 2	2 16 2	2 14 8	2 13 10	2 14 1	2 12 7	2 8 5	2 5 11	2 14 0
1931..	2 7 7	2 8 3	2 9 9	2 8 1	2 6 11	2 5 2	2 2 9	2 2 2	2 0 11	2 3 9	2 7 6	2 7 10	2 5 9
1932..	2 7 2	2 6 8	2 6 4	2 5 0	2 4 8	2 0 8	1 19 4	2 1 7	2 1 10	1 18 10	1 19 8	2 2 1	2 2 0
1933..	2 3 4	2 4 6	2 4 6	2 4 1	2 3 5	2 2 8	2 3 7	2 4 8	2 5 8	2 5 9	2 5 7	2 5 0	2 4 5
1934..	2 6 10	2 8 9	2 7 8	2 6 6	2 7 6	2 8 0	2 6 10	2 6 7	2 8 0	2 8 2	2 9 1	2 11 5	2 7 1
1935..	2 11 3	2 11 4	2 11 1	2 11 3	2 12 0	2 11 1	2 11 1	2 11 0	2 12 2	2 13 10	2 14 5	2 14 8	2 11 9
1936..	2 16 3	2 18 7	2 18 9	2 19 2	2 18 7	—	—	—	—	—	—	—	—

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(A remittance should accompany instructions.)

SITUATIONS VACANT AND WANTED

ADVERTISER seeks change. Thorough knowledge sanitary castings, etc. Foundry representation in London and Southern Counties preferred. Age 38. Highest references.—Box 742, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

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EXPERIENCED Foundry Manager requires position. Sound technical and practical training. Experienced as manager of well-known malleable and also important grey-iron repetition foundries. Can undertake all management duties, practical, technical and commercial. (276)

POSITION required as Foundry Foreman. Marine engineering and general engineering experience of varied character. (277)

FOUNDRY Manager requires re-engagement. Sound experience in motor cylinders and repetition work, general engineering up to 20 tons, steelfoundry and non-ferrous. (278)

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NEW Dwarf Cupola, to melt 10 to 15 cwts. per hr. New Worm-geared Ladles, 5 tons, 25 cwts., 15 cwts. and 10 cwts. capacity. Ungeared Ladles, 15 cwts. and 10 cwts. capacity. Improved Cupola Spark Arresters.—T. DAVIES & SON, West Gorton, Manchester.

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MISCELLANEOUS—*Continued*

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Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea?

The Chairman,

SCHOOL FOR THE BLIND

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